

Global warning: live from the climate-change frontline as Trump becomes president

With climate sceptics moving into the White House, the Guardian will spend the next 24 hours focusing on climate change happening right now, and what we can all do to help protect the planet

LIVE Updated

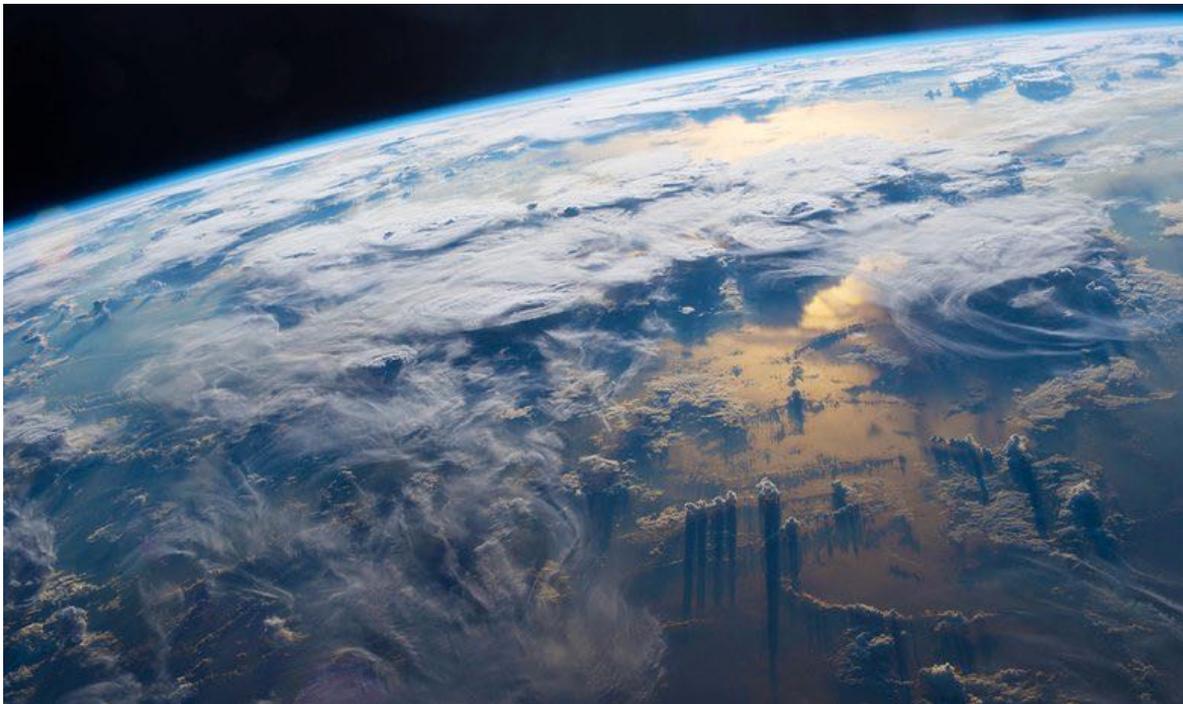
Just yesterday 2016 was confirmed as the hottest year ever recorded. Data suggests the Earth has not been this warm for 115,000 years. Photograph: ISS/Nasa

[Mark Rice-Oxley](#)

Thursday 19 January 2017 07.14 GMT

[7.14am 07:14](#)

Damian Carrington



A fork in the road

Humanity stands at a fork in the road, with one route descending towards disaster and the other climbing towards a brighter future. The route taken depends on whether the world can

tame [global warming](#), which threatens a violent end to the mild and stable climate the world has enjoyed since the start of civilisation.

Many fear the inauguration of Donald Trump as the US president on Friday threatens to push us down the dark path. That's understandable: he has called global warming a hoax and appointed climate-change deniers and [oil barons](#) to key posts.

But the unpredictable Trump and his team have already [stepped back from a threat to abandon the global climate deal](#) agreed in Paris in 2015. Hope remains – just – that with the right advice and pressure, Trump may see the challenge of climate change as the great opportunity it also represents.

Beating climate change requires nothing less than rewiring the global economy to run on zero-carbon energy – work that must start now but will take decades. As the climate economist [Lord Nicholas Stern](#) tells the Guardian: “The urgency and scale is not sufficiently understood.”

But this titanic challenge also offers extraordinary opportunities: trillion dollar markets for green technology and the prospect of a clean, sustainable and fair world. The US is the most vibrant crucible for new technology the world has seen and embracing the transformation to a green economy would deliver jobs and prosperity to many Americans.

[Investment](#)

Will Trump the dealmaker grasp the opportunity before Trump the climate-change denier throws it on a fossil fuel bonfire? Grabbing the chance would be a great way to “make America great again”, as many US cities, states and [US businesses](#) already realise.

In contrast, not doing so will help make China great again, as its extraordinary transformation into a climate leader accelerates.

Indeed the rest of the world's nations have shown they remain resolute in pushing on, with or without the US. Even [Saudi Arabia](#), which for years frustrated global climate talks, is now [backing the renewables revolution](#) with billions.

The prize of beating climate change is a glittering one and still just within reach. Global carbon emissions have levelled off. But that only means we are no longer accelerating towards the climate cliff edge – just speeding along at a steady 100mph towards the “[severe, widespread, and irreversible impacts](#)” projected by the world's scientists.

A foretaste of those severe weather impacts has already arrived in many places, via scorching heatwaves and floods made far more likely by the overheating planet. To avoid climate breakdown, emissions must fall to zero in a few decades at most and that means ramping up action right now. Given the scale of the challenge, people can feel powerless to make a difference. But ask the key players around the world what individuals can do and one answer recurs more than cutting down on flying, giving up meat and saving energy: demand action from your elected representatives today.

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[7.03am 07:03](#)

What we're doing today



Mark Rice-Oxley

[icon](#)

Hello and welcome to this live climate change special, in which we will be reporting from all seven continents on the climate change already underway – and the promise of solutions – in one 24-hour period.

The plan is this: starting in London, we will generally follow the sun as daybreak falls around the world. We'll be in Europe, Africa and the Middle East for the next few hours before crossing the Atlantic to look at the Americas during their morning.

And finally we'll move down to Sydney to hear about Asia-Pacific as that part of the world wakes up on Friday morning. All building towards Donald Trump's big moment in Washington later in the day.

We're teaming up with social network Tumblr and Spanish-language US broadcaster Univision to cast the conversational net far and wide.

Of course, Trump is on record as questioning the science behind climate change, and the link between the warming planet and the transformation of our weather patterns.

But we'll hear from people who, unlike Trump, live on the front line of climate change – in Bangladesh, Egypt, Canada, Bolivia, Malawi, the South Pacific – parts of the world where climate sceptics (or doubters, if you prefer that word) are few and far between.

Already today we have heard from [more than a dozen top global warming experts](#) who pinpoint why Trump's revisionism is not just dangerous but a self-inflicted wound. And we have heard Xi Jinping, China's president, [wax lyrical](#) about the urgency of the moment:

There is only one Earth in the universe and we mankind have only one homeland ...

It's not all gloom though. There's a tremendous amount of work – science, innovation, activism and diplomacy – that should give readers hope. We'll be highlighting the saviour

technology that can yet make a big difference and the little things you can do in your life to join the climate movement.

Other highlights will include a [quiz](#), a [doomsday carbon countdown clock](#), a Facebook live attempt to sketch climate change, and a film from the bottom of the earth.

Our icons will indicate what each post is about, whether it's drought, heat, oceans, flooding, food or ice melt – or just advice or commentary.

So drop in from time to time, and see how we're getting on. After all, in the time it's taken you to read this, we've churned out another [100,000 tons of carbon](#). Next up will be Damian Carrington our head of environment, on why this is such a critical juncture for our species, and indeed every species on this planet.

We'll be reading all comments below the line, please do join the conversation.

Global warning: ominous signs for climate in Trump administration – live

With climate change doubters moving into the White House, the Guardian is spending 24 hours focusing on the issue. Right now we're looking at how rising temperatures and drought can affect everyday lives

Our partner, Univision News, is hosting a parallel event in Spanish today. Follow it here

The Tumblr community is joining us with personal posts about climate change. See them here

LIVE Updated 1m ago

A field of dead almond trees in Central Valley, California, where drought has been a persistent environmental issue. Photograph: Lucy Nicholson / Reuters/Reuters

Mark Rice-Oxley , Oliver Milman (earlier) and Alan Yuhas (now)

Friday 20 January 2017 00.57 GMT

13s ago

04:09

HOURLY 21: Blue skies, thick smog

Elle Hunt

We're in the final stretch now. Here's what we've covered in the last

hour:

The first-ever all-female expedition to Antarctica [asks the question](#): is climate change a gender equality issue?

Blair Palese, the chief executive of 350.org Australia, on [how climate change deniers take their tactics](#) “straight out of the tobacco playbook”; 350.org’s campaign [against the Carmichael coal mine](#); and what you can do to [help combat climate change](#)

China correspondent **Tom Phillips** [takes his air pollution-monitoring](#) “egg” for a walk around Beijing – and runs into **Boris Johnson**

The [sperm bank that could](#) hold the secret to saving the world’s coral reefs

We’d love to hear more from you below the line, or on Twitter: I’m at @mle_elle, **Mikey** is @MikeySlezak, and we’re using the hashtag #GlobalWarning.

It’s also been some hours since you were last made aware of a penguin.



Photograph: Andrew Orr / Barcroft Images

18m ago

03:50

And here’s the final part of our Q&A with **Blair Palese**, chief executive of 350.org Australia.

Question: What’s the most important thing that individuals can do to help prevent climate change?

Blair Palese:

I think it's important that we all take responsibility for climate change as we've all been part of the system that created it. We have the power to decide who governs us and what issues made the priority agenda no matter what vested interests do or say to stymie action. And as consumers we have huge power to decide where our money goes.

Anyone concerned about climate change needs to engage in politics, call your elected officials, email them, meet them at events and tell them you want urgent action or you'll vote them out. Talk to people about it in your community, take steps together locally to make a difference. And think hard about what you are doing with your money. If you don't like what your bank or superfund is investing in – say fossil fuel projects – tell them that and move to one that is fossil free.

Finally, get involved with a group or issue you care about – help us stop the Adani coal mine, take on Chevron's plans to drill in the Bight, switch your power company from the big three to a company investing in and campaigning for renewable energy. If you don't have time, donate to keep the campaigning alive. Any one of these steps will make a real difference.

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23m ago

03:44

Here's another part of the Q&A I did with 350.org Australia's chief executive **Blaire Palese**. Here she discusses the recent successes of the climate movement, and what we're going to see this year.

Question: Despite some big setbacks, the climate movement has claimed some victories too. It now looks like the whole movement in Australia is focussing on stopping Adani building the Carmichael Coal mine. What will that campaign look like?

Blaire Palese

*The **divestment** of more than A\$6 trillion (US\$5.2 trillion) from fossil fuels is something I and the 350.org team are particularly proud of. The campaign started off very much as a symbolic effort. But much to our amazement after three years, it was all about money – and lots of it! – being moved from coal, oil and gas. Some 688 institutions and 58,399 individuals across 76 countries have committed to divest in some way. This is a real indicator that people are frustrated with government inaction and are taking their own steps to be part of the climate change solution.*

*The **Victorian gas ban** could not have been achieved without a strong coalition of farmers, rural communities and city progressives that became a force that could not be ignored by the Andrews Government.*

Getting BP to drop plans to drill for oil in the Great Australian Bight was a different story, with environmental groups using delaying tactics and the threat of a global public campaign to ensure the project was too costly and unviable.

Right now, efforts to stop Adani from building the world's largest new coal mine in Queensland is, for most of us concerned about climate change, the most critical fight in the country right now. Australia hasn't opened up a new mineral reserve in 40 years, and if the Adani project goes ahead, the whole Galilee Basin could be developed, which would unleash enough coal to tip the carbon budget not just for us, but for the whole world. A broad coalition of environmental groups, local communities and Traditional Owners are coming together to do all we can to ensure this project doesn't see the light of day. If you'd like to do something about climate change, join us to stop this climate-threatening coalmine!

Updated at 3.45am GMT

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30m ago

03:38

Elle Hunt

While the Queensland state government [has said it's doing all that it can](#) to preserve the Great Barrier reef, a different kind of preservation work has been ongoing far from the reef – even the coastline – in regional New South Wales.

Since 2011, scientists from Sydney's Taronga Zoo, the Australian Institute of Marine Science and the Smithsonian Institution have been collecting and freezing coral sperm to store at Taronga's CryoReserve in Dubbo.

The project began in Australia in 2011, but has international partners that ensure the preservation of coral reefs worldwide. "It's a bigger collaboration than just the Great Barrier Reef," said coral scientist **Bec Hobbs**.

Dr Rebecca Hobbs in the lab. Photograph: Supplied/Taronga Zoo

By freezing the cells in liquid nitrogen to preserve them indefinitely, scientists can use similar technology as sperm-banking for human IVF to grow new coral and make entire reef systems more resilient to coming change. Researchers are also investigating the possibility of freezing coral eggs and larvae.

There are more than 600 species of coral on the Great Barrier Reef – in the last spawning event in November, scientists were able to add four more to the bank, said Hobbs.

"At the moment we have samples from about a meagre 11 species, but that is still the most species that are banked anywhere in the world."

But their efforts to collect more species have been frustrated by lack of knowledge about reefs and coral reproduction. “We know quite a bit about certain species and others, relatively nothing,” said Hobbs.

The research currently being carried out by Reef Recovery Initiative partners, then, is all the more vital for preserving the future of reefs.

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44m ago

03:24

Our correspondents around the region have been monitoring the air quality in their various cities.

While Beijing is usually incredibly smoggy, Tom Phillips is reporting unusually blue skies and remarkably low PM2.5 readings.

Tom Phillips

(@tomphillipsin)

Beijing marking Guardian's [#globalwarming](#) extravaganza with gorgeous blue skies & rock bottom air pollution levels pic.twitter.com/xBxwqNT9Sc

January 20, 2017

Tom Phillips

(@tomphillipsin)

[@tomphillipsin](#) air quality in Guardian bureau a magnificent, lung-cleansing (and rare) 4! pic.twitter.com/qczg8r9JGb

January 20, 2017

But when Tom descended into the subway, things didn't look so great.

Tom Phillips

(@tomphillipsin)

[@tomphillipsin](#) on the underground, situation not so great. 4x WHO 'safe' levels on my commute to work this morning [#globalwarming](#) pic.twitter.com/KcrvN2ZcZy

January 20, 2017

Tom Phillips

(@tomphillipsin)

[@tomphillipsin](#) the air quality around this poster of boris johnson also not great [#GlobalWarning](#) pic.twitter.com/0G61wm1DZo

January 20, 2017

Updated at 3.28am GMT

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51m ago

03:17

Blair Palese is the chief executive of 350.org Australia. I asked her a series of questions about the climate movement here and abroad. Here's the first question and answer:

Question: The rise of Trump in the US, and the continued lack of federal action on climate change here in Australia, must be seen in some ways as a failure of the climate movement. What lessons can be learned from what's happened in recent years and how can the climate movement win?

Blair Palese:

Climate change is an incredibly difficult issue for people to get their heads around. Complex, yes, but more importantly, made confusing by media with vested interests questioning climate change science – a tactic straight out of the tobacco playbook. Understanding that science is never 100% certain is not something most of us think much about, so it's easily exploited. And, as our movement is up against the most cashed up industry in the world – the fossil fuel industry – it's a David vs Goliath battle to convince people and politicians that the longer we wait, the harder and more expensive are the steps we must take to stop climate change.

That said, those working on the issue do need to reach out more broadly to everyone, everywhere about the importance of the issue and ensure our movement spans the political, race, gender and age spectrum to be truly representative. It's worth remembering that the People's Climate Marches of 2015 saw more than 600,000 people take to the streets in 175 countries -- by all accounts the biggest thing of its kind in history.

Our job now is not only to raise the alarm about climate change but to communicate the huge benefits we will all get from solving it. Our voices need to be loud and varied if we are to successfully stand up to fossil fuel dollars.

Come back soon to see some more Q&A's with Blaire.

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53m ago

03:14

Elle Hunt

The [Homeward Bound Project](#) aims to take 1000 women working in science around the world to Antarctica to increase their influence and impact in policy and decision-making.

Belinda Fairbrother, the community conservation manager at Sydney's Taronga Zoo, was part of the inaugural contingent of 76 women to spend 22 days in Antarctica in December: the largest-ever

female expedition to Earth's southernmost continent.

She said the impacts of climate change were keenly felt there, with the Antarctic peninsula was among the fastest-warming places in the world and penguin populations suffering.

“It really brings home the challenges we face elsewhere in the world.”

Photograph: Supplied/Taronga Zoo

Having met scientists at Palmer Station, a US station in the Antarctic, she realised that no progress was possible alone, and that storytelling was as important as facts in mobilising people to act.

“In these remote landscapes, that's what really struck me – we need to work together, past issues and conflict. Going forward, that radical collaboration is what we're going to need to deal with climate change as a global issue.”

Hearing personal accounts of knowledgeable people experiencing the effects of climate change firsthand and working to combat them helped to mobilise her, said Fairbrother: “Data's only going to get us so far. ... [Climate change](#) is real but what's also real is people's innovation and ability to stand up to issues like this.”

Fairbrother also said her experience had shown her that gender equity and more equal decision-making was a key part of the solution to climate change.

The Homeward Bound Project aims to elevate each participant's leadership capabilities and profile with view to addressing underrepresentation of women in positions of power and influence, “to impact policy and decisions towards a sustainable future”.

There are already hundreds of women waitlisted for the second program, to depart in 2018.

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1h ago

03:07

HOOR 20: Through the smog

Elle Hunt

We started on Lizard island and went all the way to China, by way of the Tumblrverse and [a possible planet populated only by carp](#).

“There's no time to lose”: a coral reef scientist [urges governments to act on carbon emissions](#)

Street violence over water supplies not some future dystopia, but [a present](#)

reality in [Tamil Nadu](#), southern India

John Connor, chief executive of the Climate Institute, comments on [the slow-moving gains](#) of climate policy

China correspondent **Tom Phillips** reports back from [one of the largest solar farms on Earth](#) in Qinghai province

Millennial lobby group **Generation Zero** [gets to advocates young](#) in New Zealand

The worst mangrove dieback in recorded history in Australia's Northern Territory, and [the ramifications for that](#) coastline

Smog from China aggravates a [severe air pollution problem](#) in Hong Kong

Mikey Slezak [looks to the future](#)

Calla Wahlquist with the latest on [“fire behaviour” analysis in Victoria](#), Australia's most fire-prone state

China [doubles down on its pledge](#) to cut carbon emissions – no matter what the Donald may do

Meanwhile, [here's the carbon countdown again](#) – only 27.5% of the total carbon budget remaining in tons (CO₂-e), if we want to limit human-induced warming to less than 2C.

And [here's a thoughtful response](#) to **CassandrasVoice's** [earlier question](#) about how long – specifically – we've got before climate change has severe enough impact on the majority for us to act.

KIRSTEN COWLEY

20 January 2017 2:02am

Been trying to find similar information for the last 5 years. I believe if the general public were to know how climate change will impact on their day to day living, as well as when these changes will occur, there would be many more involved in climate action. But scientists are conservative creatures and putting up such predictions would inevitably be very difficult due to inherent uncertainties in the modelling, which relies on very complex algorithms. There would also be cries from the tired old deniers of alarmism which may cause wholesale derailment of any climate action. And most people I feel, would rather be ignorant of the impending doom that awaits them.

Updated at 3.08am GMT

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03:04

Tom Phillips

Li Shuo, a Beijing-based campaigner for Greenpeace, is among the

activists hoping that China, the world's largest polluter, will take up a greater leadership role on climate change in a post-Trump world.

Li is an expert in clean energy, air pollution and climate change and also studied US-China relations at Nanjing University in east China.

Writing in the Guardian today, Li argues that Trump's election "casts a dark shadow on the prospect of future international climate cooperation" but says Beijing's apparent willingness to take on a larger role offers some hope.

You can read Li's full piece here:

China eyes an opportunity to take ownership of climate change fight

Li Shuo

The economic and environmental cost of pollution will drive Beijing's policies regardless of what Donald Trump does

[Read more](#)

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1h ago

03:00

I recently sat down over Skype with the chief executive of Greenpeace Australia Pacific, David Ritter.

I pressed him on whether or not the election of Trump in the US meant that the public has stopped caring for climate change. He was adamant that was not the case.

"There's much that might be said about this election but i don't think we can in any way treat it as a mandate for inaction," he said.

"One of the sad ironies of protest electoral votes may be that some of those who have been most left behind by an economic system that is deepening inequality, and are lashing out and voting for candidates seen as anti-establishment, are also people that are at the greatest risk from global warming when we see extreme weather events, we see extreme temperatures and so on. So I don't think there's any doubt that inequality and climate change are intimately, intimately connected."

Check out the full video below. And tweet your comments or thoughts to me at @mikeyslezak or to David at @David_Ritter, or leave them below in the comments.



Interview: David Ritter, chief executive, Greenpeace Australia Pacific

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1h ago

02:53

Tom Phillips

The war on global warming is “a responsibility we must assume for future generations,” Chinese president told the world’s economic elite in Davos this week, signalling that Beijing would stay true to its pledge to cut carbon emissions, even if Donald Trump did not.

China has several reasons for sticking to its guns.

Firstly, there is consensus in China that the country is likely to be among the biggest victims of climate change: [a 2015 government report](#) warned rising sea levels, temperatures, and rainfall posed a real and present danger to hundreds of millions of Chinese citizens.

[Melting glaciers](#) in China’s extreme west and [the desertification of large swaths of land](#) in the north have set alarm bells ringing in Beijing.

Secondly, Beijing understands it must take action against deadly episodes of air pollution that are fuelling increasing public rage. China’s leaders view climate change mitigation as an effective argument with which to take on the powerful energy sector responsible for the smog, which is blamed for up to one million premature deaths

per year.

Thirdly, and perhaps most importantly, Beijing sees huge economic benefits in transitioning towards a consumption and services based low carbon economy and becoming a world-leader in the energy technologies of the future. Already [its global dominance of the renewables market](#) is becoming clear through billions of dollars of overseas investment last year in countries from Australia to Brazil and Pakistan.

China is now the world's largest investor in clean energy and recently unveiled plans to [pump more than \\$360bn into renewable energy sources](#) by 2020.

Finally, there is the question of soft power. With a climate denier now occupying the White House, some in Beijing see a golden opportunity to boost China's global standing by spearheading the war on global warming.

[Xi's speech at the World Economic Forum](#) - in which he urged the world to "meet the challenges of climate change" and praised the Paris climate deal as "a hard-won achievement" - suggests China may be preparing to do just that.

"History," the Chinese president told his audience to loud applause, "is created by the brave."

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1h ago

02:50

Calla Wahlquist

Lightning struck bushland east of the coastal Victorian town of Wye River on 19 December, 2015. On 25 December the fire burned the town, destroying 116 homes.

Most of the residents had already been evacuated on the order of fire authorities, who mapped the fire behaviour, with astonishing accuracy, five days earlier.

The mapping system, called Phoenix, allows fire behaviour analysts to input data about the terrain, dryness of the fuel, predicted temperatures, and predicted wind patterns, and come up with a predicted image of fire behaviour.

Until 2010, this was done with considerably less accuracy using a pocket calculator and a slide-rule, crosshatching on paper maps. As fire behaviour analyst Andy Ackland explained in the video below, the

mapping system also predicts the occurrence of convection currents, where a blast of hot air pushes through the inversion layer of the atmosphere. That's one of the key conditions of a firestorm.

The system is used to inform public warnings and help firefighters prioritise when there are multiple fires on the same day (bushfires tend to come in crops of 12, Emergency Management commissioner Craig Lapsley said). It is also used in a strategic sense to figure out which power lines are most likely to cause devastating bushfires. Ackland said it is increasingly used to map potential changes in bushfire risk caused by long-term climate change, which is drying out the mountain ash forests around Victoria and leaving them more prone to a severe bushfire.

“Some of the most extreme fuel loads that you would see anywhere in the state are that type of mountain ash fuel,” Darrin McKenzie, deputy chief fire officer of Forest Fire Management said.

Like many Australian trees, mountain ash has evolved to use fire to regenerate, shedding long ribbons of bark to create fuel. That strategy backfires in a catastrophic fire Black Saturday in February 2009, which burned hot enough to kill the mountain ash seeds and, with that, jeopardise the whole alpine ecosystem.

Updated at 2.52am GMT

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1h ago

02:41

An interesting comment below the line.

slaine Lower

20 January 2017 2:01am

What one comes away with from this and many of the comments here, is that it will be the China, unbelievable only a few years ago, that will be the global power leading sustainability. I never thought that in my life time I would see the inevitable decline of the USA and the rise of another superpower; and less so that that would be China. Trump and the alright have done an extraordinary thing in such a short time.

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02:41

Earlier today I posted an [opinion piece I wrote](#) today about panic and despair, and other emotions a lot of people feel when writing about

climate change.

In that piece I mention a moment I felt almost panicked, while I was half-way through **James Bradley**'s brilliant novel *Clade*, which is set a few decades in the future. Here's something James has written for the blog today about the process of writing a book about the future of climate change, as that change was happening:

Back in 2012, when I began writing the book that would become Clade a lot of what I was writing was science fiction. Although there was no question climate change was an urgent problem, or that its effects were already being felt, most of the dire predictions still lay somewhere over the horizon.

Yet as I wrote a peculiar and discomfiting thing began to occur. Events I was weaving into the fabric of the novel – the release of methane from the seafloor and the permafrost, mass die-offs of wildlife, the breakup of the Antarctic ice sheets, even changes in the Earth's rotation due to the shifting weight of melting ice – started to move out of the pages of the book and into reality.

The sense of hastening intensifies with every passing day. A decade ago it was possible to say the window for stopping dangerous climate change was closing, but that's no longer true. If you live in the Pacific, or Africa, or many other parts of the world dangerous climate change is already here. The question is no longer whether we can avert dangerous climate change but whether we can avert a runaway climate catastrophe.

There are days when I wonder whether continuing to believe that might be possible isn't simply denial, a refusal to confront the truth. Speak to any scientist working in a field connected to climate change and you will quickly encounter a deep seam of despair. What is happening is occurring so quickly, so irrevocably it often seems overwhelming.

Yet another part of me knows this sort of despair is self-fulfilling. Change doesn't come from giving up, it comes from practical action and engagement. But it also requires hope, and hope requires we believe change is possible.

Benjamin Haas

Hello from smoggy Hong Kong.

[View image on Twitter](#)

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Laurel Chor



@laurelchor

This the Hong Kong harbour, captured 6 hours apart. The Air Quality Index is 128 right now. [#airquality](#) [#airpollution](#) [#cough](#)

10:23 PM - 19 Jan 2017

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Despite its reputation as a futuristic global city, Hong Kong has terrible air quality and the government has been slow to respond to the problem. Nearly all [government pollution targets](#) far exceed [World Health Organization recommendations](#).

In terms of PM2.5, tiny particles that cause haze and have been linked to cancer, government targets are three times higher than the WHO. Even during the best year for deadly PM2.5, levels were still more than twice WHO guidelines.

Congested roads flanked by skyscrapers cause a “street canyon” effect, where pollution caused by road traffic can be trapped and recirculate, exacerbating the problem.

Hong Kong’s port, [one of the busiest in the world](#), is also a massive source of bad air. Ships are only required to switch to cleaner fuels when docked at port, so the entire journey sailing through the city’s waters is [emitting high levels pollution](#). On top of that, almost all of Hong Kong’s power comes from fossil fuels.

Lastly, let’s not forget Hong Kong’s neighbor to the north: China. Smog from China often wafts into Hong Kong, aggravating an already severe problem.

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Benjamin Haas 本雅明



@haasbenjamin

Air pollution in Hong Kong vs Beijing last night. Hong Kong 4+ times WHO levels for deadly pollutant pm2.5, Beijing clear [#climatewarning](#)

3:17 PM - 20 Jan 2017

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Benjamin Haas 本雅明



@haasbenjamin

Hong Kong 12 hours after last tweet: air pollution blown away.
Here's how my air monitor stacks up against gov readings

[#climatewarning](#)

3:21 PM - 20 Jan 2017

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1h ago

02:30

Helen Davidson

About 20% of Australia's coastline – 11,000km – is lined with 52 different species of mangroves, with more than a third of it in the Northern Territory.

But last year something extraordinary occurred in the Gulf of Carpentaria, when scientists were informed of [a mass dieback along a stretch about 700km long](#).

It was the worst mangrove dieback in recorded history, covering 7,000 hectares, and came at the same time as the more highly publicised

coral bleaching event on the Great Barrier Reef.



Aerial footage of 'unprecedented' mangrove die-off in the Gulf of Carpentaria in Australia, taken in mid 2016. The die-off is thought to be a result of low rainfall and warm temperatures. Photograph: Professor Norm Duke/James Cook University

Believed due to a combination of factors related to climate change, the mangrove dieback has serious ramifications for the health of that coastline and future erosion, but went largely unnoticed at the time.

“Essentially the plants died because of moisture stress and that’s linked with a combination of factors,” Prof Norman Duke, an expert in mangrove ecology from James Cook University, tells the Guardian.

“High temperatures obviously, a lack of rainfall, and strangely also a temporary drop in sea level at the critical time when these plants were so stressed out because of the climate itself.

All these factors are related to the southern oscillation index, the El Niño southern oscillation cycles, and that means that they’re related to climate in general.”

Duke says the dieback and subsequent response were pretty indicative of how the issue of climate change is dealt with in the NT.

“I may not be privy to all that’s going on but from my perspective, we just have to look at the example of the die back. The only reason we know is because of concerned community members sending in pictures to me and others saying: we think something’s going wrong but nobody else is interested. That took four, five, six months in 2015 from when it was first publicised.”

“It’s now well over a year since the dieback started and still there is no

dedicated surveys going on on the ground to establish what has gone on, the extent of it, and what we can do about it and what are the consequences, which are potentially enormous.”

Updated at 2.49am GMT

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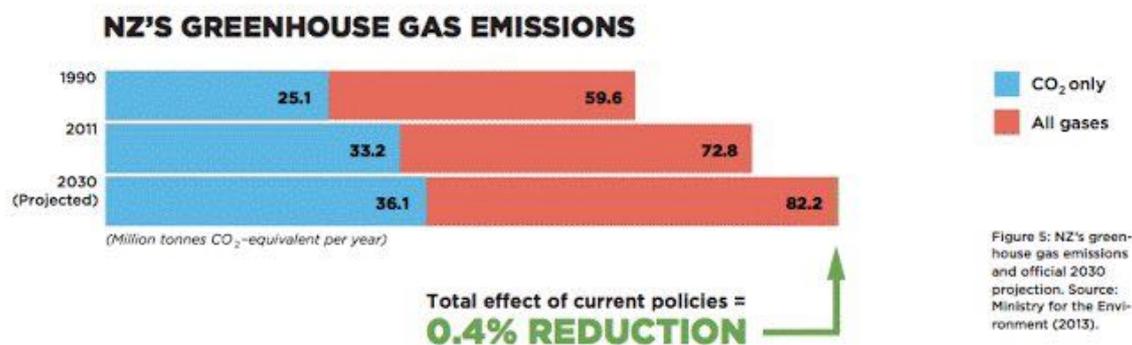
2h ago

02:28

Eleanor Ainge Roy

When **Pubudu Senanayake** cycles through the Christchurch CBD he feels a quiet sense of satisfaction that New Zealanders are adapting their island home of 4.5m to be more climate-friendly. A NZ \$150m cycle network in Christchurch and increased rail services in Auckland are recent wins.

Senanayake is a member of youth-led lobby group **Generation Zero**, formed in 2011 with the aim of pushing the New Zealand government to take swifter action on climate change, and reduce greenhouse gas emissions to net-zero by the year 2050. He says successive governments have not “understood the urgency with which we need to act”, with emissions increasing.



Sudhvir Singh

(@sudhvir)

Are ever-increasing emissions a 'moderate' response? I PM on #climatechange: moderate not extreme response needed <https://t.co/kgP5DyebUJ> pic.twitter.com/0faXjIO6F3

January 15, 2017

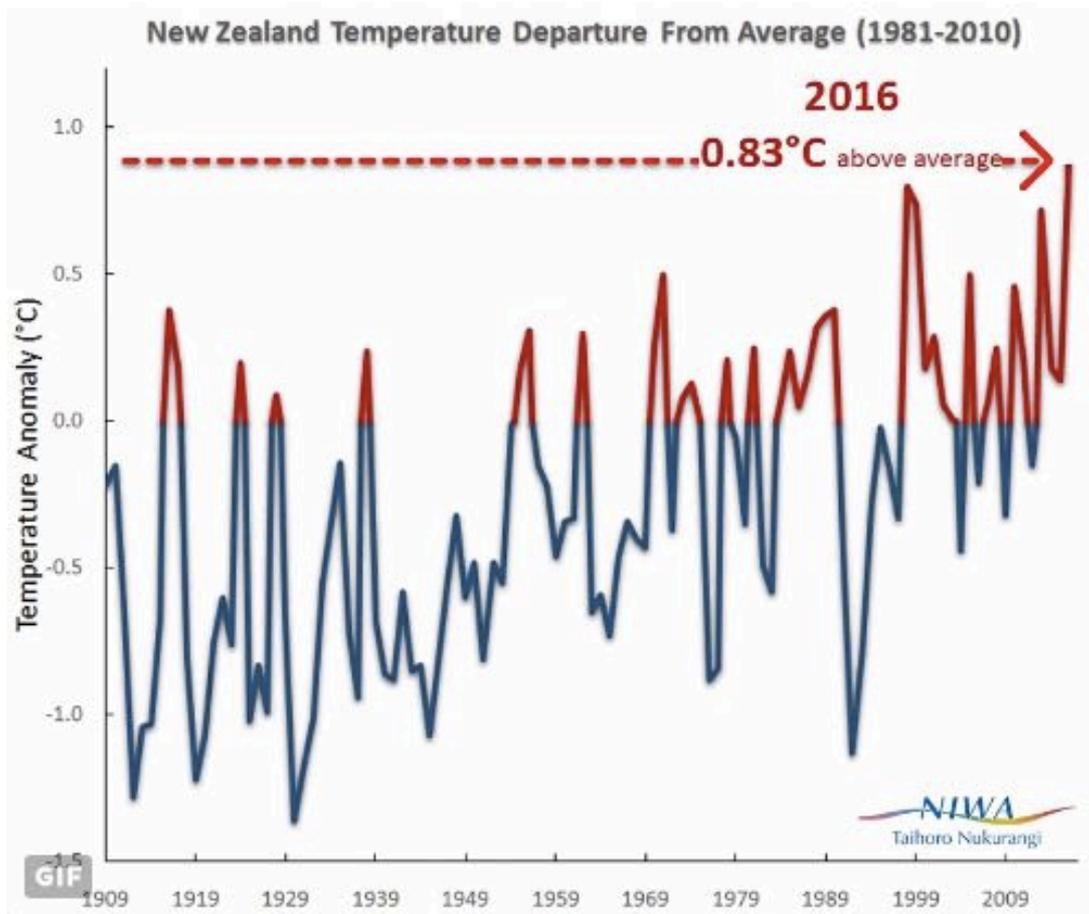
With over 30,000 members and high-profile, imaginative lobbying action, Generation Zero campaign as vociferously for leadership from government as they do for individual choices such as eating less meat or walking to work.

A number of members, “empowered to act” while at university, have gone onto work for NGOs or in government, says Senanayake. “We try to increase youth participation in the civic process and help youth gain

more skills and knowledge to have an impact at the policy level.”

For Senanayake and his fellow climate warriors the pay-off is clear: a sustainable New Zealand for decades to come.

“Climate change is not just an environmental issue. The symptoms are environmental but the issue is social and economic. And the urgency with which we need to take action makes me pretty devoted to it.”



Niwa Weather
(@NiwaWeather)

It's official: 2016 was the WARMEST 🌡️ year on record in #NewZealand since 1909, based on NIWA's seven-station series. #NZACS #climate pic.twitter.com/9FcW1v2hrl

January 8, 2017

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2h ago

02:25

My colleague **Tom Phillips** has just filed this piece from Qinghai province in western China.

Tom is back from spending two (freezing cold) days there on the

Tibetan plateau visiting what is reputedly the largest solar farm on earth and one of a growing number of super-sized symbols of China's quest to transform itself from climate villain to green superpower.

"The scale of the solar park is just extraordinary and building it was clearly a huge, huge task," says Tom. "Engineers there told me thousands of workers had taken part in construction, braving temperatures as low as -20C to turn the region into a sea of silicon panels."

You can read the full piece below and come back soon for more from Tom.

China builds world's biggest solar farm in journey to become green superpower

[Read more](#)

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2h ago

02:17

John Connor has been the chief executive of the Climate Institute in Australia for 10 years. In that time, he's seen federal climate policy begin to be established, only to be dismantled and then replaced by ongoing stagnation.

I spoke with him and asked him whether the lack of movement meant the climate movement had been doing things wrong, whether Trump's election was the death knell for the Paris Agreement, and what individuals could do to help prevent climate change.

Watch the video here:

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Interview: John Connor, Climate Institute chief executive

Updated at 2.27am GMT

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2h ago

02:14

Michael Safi

Parched reservoirs, street violence over dwindling water supplies, and the emergence of a “water mafia” sound like some fevered vision of a future dystopia. Except, all three are already happening in parts of southern India, and most acutely in Tamil Nadu.

One of India’s wealthiest and best developed states, Tamil Nadu is nonetheless in the grip of its worst water shortage on record. This year’s monsoon brought less than half the usual rainfall. The reservoirs that supply Chennai, the capital, are at around 13% capacity – and the state still must weather six hot months before the monsoon rains returns in July.

Rural areas already appear to already be in crisis: India’s human rights agency estimates [at least 106 farmers](#) have killed themselves in the past month.



Water scarcity in Tamil Nadu, south India. Photo shot in town of Thoothukudi town on 17/01/2017. Photograph: Amirtharaj Stephen

It isn't all down to climate change. "The way Tamil Nadu is geographically rendered denies it access to precipitation," says Jayshree Vencatesan, the managing trustee at the environmental group, Care Earth Trust. Mismanagement of crops and existing water resources also takes some share of the blame.

But the annual monsoon season, the state's lifeline, is bringing less rain than it used to. And when it does finally pour, the storms are intense and brutal, causing destructive floods of the kind that have [ravaged Chennai](#) each December of the past two years, killing over 300 people.

And though researchers are yet to study the link, Vencatesan says the state is "consistently warmer" than in the past. "You don't really have a great seasonality. So, you have a monsoon, that's followed by an intense summer – and there's an immediate drying up of the system," she says.



Water scarcity in Tamil Nadu, south India. Photo shot in town of Thoothukudi town on 17/01/2017. Photograph: Amirtharaj Stephen

Tamil Nadu has been forced to beg surrounding states for help. In September, it won a legal battle with neighbouring Karnataka state for more access to water from the Cauvery, a river the two states share. But Karnataka too is desperately thirsty. The result was [days of anti-Tamil violence](#) in the streets of the Karnataka capital, Bangalore, including the torching of dozens of Tamil-owned vehicles and businesses. Demonstrators carried signs that read: “We will give blood, but not Cauvery.”

Some unscrupulous water-tanker drivers have begun to exploit the situation. Vencatasan says hundreds are involved in buying water from farmers, and hauling it to villages where supplies are low. There they hock it for a steep markup. “They haven’t reached the point of forming cartels yet,” Vencatasan says. “But they are a water mafia.”

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2h ago

02:14

Elle Hunt

We’ve collaborated with Tumblr to create a “quilt” of user-submitted [messages and artwork](#) about climate change for this Global Warning project. Here’s my new favourite submission:

<https://globalwarning.tumblr.com/post/156099550876/global-warming-is-not-only-real-but-is-having>

“A world full of carp is probably not the long-term goal”. Let us know if

you disagree in the comments!

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2h ago
02:10

After speaking with **Anne Hoggett** about the devastating bleaching that hit the Great Barrier Reef, I asked her what she thinks individuals can do to help stop climate change to protect the reef from bleaching.

Here's what she said:

Let our government know that you want them to take meaningful action to contain carbon emissions - now. There's no time to lose.

Throughout the afternoon, we're going to hear from a number of people about what they think individuals can do to help stop climate change.

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2h ago
02:07

HOOR 19: Adding sugar to water to mask salt

Elle Hunt

I've got to say, the hours are flying by as we steer the live blog back to London. It's 1pm here in Sydney, it's pouring down with rain, and **Mikey Slezak** has just inhaled a cheeseburger in between blog posts.

In the past hour:

Guardian Australia's photographer extraordinaire **Mike Bowers** [shared a shot and a story](#) from his trip to Kiribati, featuring prominently in our coverage today as a site on the bleeding-edge of rising sea levels

Jason Roberts answered [just one more question for us](#) from Casey Station in Antarctica

My colleague **Calla Wahlquist** reported back on how Victoria, the most fire-prone state in Australia, [approaches bushfire management](#)

David Tong, now of WWF New Zealand, [gave a chilling account](#) of household items being taken by rising sea levels in Kiribati – and locals putting sugar in their water “to counteract the salty taste”

We heard from **Lock the Gate**, [a group of Australian farmers](#) concerned about

coal mining and gas extraction

Michael Safi, the Guardian's Asia correspondent, [reported from Delhi on plans](#) for the largest electricity rollout in history

Even the [Sydney Opera House faces problems](#) posed by climate change, Guardian Australia's **Joshua Robertson** found

A coral reef biologist [who's been based on Lizard Island](#) in far north Queensland for almost three decades reports back on the challenges

Here's a talking point for you to deliberate in the comments:

Jonathan Middleton

(@Midj109)

[@mille_elle](#) I have a question about climate change, I'm not sure whether to be optimistic or pessimistic about the future?

January 20, 2017

Onwards and upwards.

Updated at 2.12am GMT

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2h ago

02:01

Yesterday I spoke with coral reef biologists Anne Hoggett. She's lived and worked on Lizard Island in remote far North Queensland for almost three decades. She is now director of the Australian Museum's research station there.

Lizard Island was at the epicentre of the disastrous bleaching that killed about a fifth of the coral on the entire Great Barrier Reef.

Check out the interview below, where Anne describes what it has been like living there, and watching the impacts of climate change hit her remote home.

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Interview: Anne Hoggett, director of Lizard Island Research Station

2h ago

01:55

Joshua Robertson

The business case for adapting to climate change has dawned on a growing number of organisations in Australia, including the stewards of the Sydney Opera House.

The opera house is among the 10 best business cases in Australia to show how it could be done, according to a [Griffith University report](#) launched last month.

The climate change risks to the World Heritage-listed building range from underground water leaks from rising sea levels and water pressure, damage from more severe storms with high winds, and flooding from more intense rainfall and run-off.



Australia, New South Wales, Sydney, Sydney Opera House, Close up at sunrise Photograph: Shaun Egan/Getty Images/AWL Images RM

The opera house has now factored in a 90cm sea level rise into its 10-yearly building renewal program. Managers told the Griffith researchers that assuming the need for climate change adaptation in its investments was a responsible “use of taxpayers’ money”.

Other cases include the insurer Suncorp, which sees a growing cost of natural disasters in northern Australia in the form of cyclones, floods and hail storms as “the game changer and catalyst for change and action”.

Over the last seven years in Queensland alone, insurers paid out \$1.44 in claims for every \$1 they collected in premiums, the study said.

After Queensland’s costly 2011 floods, Suncorp assessed the cost of a levee to protect the flood-prone town of Roma at \$11m – the same as it cost the government to provide emergency helicopter rescues for one flood.

“This presented a very strong business case for the [Queensland] government to fund the levee, which they did,” the study said.

Suncorp told the researchers that while the insurance industry has a “pretty good understanding of what the cost will look like”, this did not necessarily extend to the human costs, which are only apparent when disaster hits and insurers “turn up on the ground and start helping people rebuild their homes”.

“At that point, it becomes evident that there is a range of risks and

damages that are not ‘carried on anyone’s balance sheet’, for instance, mental health issues,” the study said.

Updated at 2.03am GMT

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2h ago

01:49

Elle Hunt

AlexMourinho raises an interesting point: could the way forward from our changing climate be posed by philosophy?

[AlexMourinho](#)

20 January 2017 12:47am

Philosophy in school.

Mandatory.

Thinking citizens is the only way out of this mess called civilisation.

On the subject of science intersecting with philosophy, on Wednesday I went scuba-diving off the north shore of Sydney with **Peter Godfrey-Smith**, an academic philosopher who’s written a book about the consciousness of cephalopods.

Other Minds: The Octopus, the Sea, and the Deep Origins of Consciousness is currently available in the US and due for release in the UK and Australia in February; Godfrey-Smith’s [New York Times column about octopuses and ageing](#) is a taster.

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2h ago

01:45

Michael Safi



Adani Kamuthi Solar Power Plant in Tamil Nadu, South India Photograph: Adani/Supplied

Hello from Delhi, India's heaving capital, where, inside government ministries, plans are being devised for the largest electricity rollout in history. India will need to supply power to nearly 600m new consumers by 2040, [according to](#) the International Energy Agency. How they choose to do so matters to the entire planet.

India's prime minister, Narendra Modi, takes climate change seriously. Extreme weather across the country, including droughts, storms, and the severest heat wave on record killed nearly 1,600 Indians, [it was reported this week](#). Food yields are already estimated to have fallen by 6% because of higher temperatures – a phenomenon that might [claim 160,000 Indian lives](#) each year by 2050.

But Modi is also emphatic that climate change “is not of [India's] making”. Historically, the country accounts for just 3% of the world's total carbon emissions since 1890. India is unapologetic about [potentially tripling](#) its coal use by 2030 if it means connecting every village to the grid and powering new schools, jobs and homes for hundreds of millions of its citizens.

Averting a catastrophic increase in carbon emissions will come down to how much of that energy can be generated cleanly. India's renewable energy target is hugely ambitious: an installed capacity of 175GW by 2022. To put that into perspective, the current capacity of India's entire grid is around 310GW.

So far, India [doesn't appear to be on track](#) to hit the 175GW target – but that's missing the point. In pursuit of such a bold aim, it has already added nearly 15GW in renewable capacity, and attracted billions of dollars in investment. The southern state of Tamil Nadu is now the site of one of the world's largest solar power plants. India's

total renewable capacity could increase by more than 50% [in the next year alone](#). It has already predicted [it will exceed](#) its Paris targets by nearly 60% – and do so three years early.

So, while the next posts will explore the threats posed by climate change to India, it's worth remembering: there's some cause for optimism, too.

Updated at 2.19am GMT

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2h ago

01:42

Lock the Gate is a large group of farmers and other citizens concerned about coal mining and gas extraction. They've successfully fought coal seam gas extraction along the east coast of Australia, and have emerged as a force to be reckoned with.

The group has just released an analysis suggesting coal mining is responsible for about half the dangerous particulate pollution in New South Wales.

Georgina Woods is the New South Wales campaign coordinator at Lock the Gate and has sent this in:

As well as dealing with more extreme droughts as global warming worsens, regional communities in Australia are suffering localised impacts of coal mining.

Lock the Gate Alliance, a network of community groups protecting their land and water from coal and gas mining, has today released analysis showing coal mining is responsible for the majority of dangerous particulate air pollution in New South Wales.

Roughly half of this is created by five of the biggest mines. They're all in the Hunter Valley – an important agricultural region, which is home to renowned wineries and horse studs.

The state's most-polluting coal mines are choking the Hunter Valley's skies, damaging the health of local people and their children, contributing to the hundreds of deaths in NSW that are caused every year by particulate pollution.

This analysis is part of Lock the Gate's submission to the NSW's government's Clean Air Plan, which closes for consultation today.

2m ago

01:35

Elle Hunt

[A big-picture question](#) posed by **CassandrasVoice** in the comments: how long have we got?

CassandrasVoice

20 January 2017 1:00am

This is a question I'd love answered by any expert who wants to weigh in:

Since a friend who works in sustainable agriculture said to me that she thought we had a 50:50 chance of becoming grandparents (i.e., that we had perhaps another 25 years before the world stops supporting human populations) I've been trying to find anything at all that quantifies the impending disaster. And it's hard to find! I read about increasing temperatures, rising seas, the sixth extinction, but it's still hard to find anybody willing to say: according to this model, if nothing changes, we have X years left before Specific Bad Things affect our daily lives.

Do you think that climate scientists should team up with communications experts and find a way to paint a stark picture of how things will (may) be, day to day, in the next generation? Just like putting faces to things like the refugee crisis helps move along the appetite for political change, it might help to have snapshots of different populations and how they'll suffer? Including and especially in the west?

It's a tough one, but if you've got thoughts or ideas, we'd love to hear them.

2m ago

01:31

We've heard about [the impact of rising sea levels in Kiribati](#), and Guardian Australia's [Mike Bowers' personal recollection of his visit there](#) – now **David Tong**, now a campaigner at WWF in New Zealand, has written about his time in South Tarawa, an atoll of only 16 sq km of land, last September.

Follow

David Tong @Davidxvx

Love to Choi, Kiribati's [#climate](#) change officer, but he's wrong to say there are no deniers there. There are two.

[https://www.](https://www.theguardian.com/environment/live/2017/jan/19/global-warning-live-from-the-climate-change-frontline-as-trump-becomes-president)

[theguardian.com/environment/live/2017/jan/19/global-warning-live-from-the-climate-change-frontline-as-trump-becomes-president](https://www.theguardian.com/environment/live/2017/jan/19/global-warning-live-from-the-climate-change-frontline-as-trump-becomes-president)

...

11:27 AM - 20 Jan 2017

Global warning: ominous signs for climate in Trump administration – live

With climate change doubters moving into the White House, the Guardian is spending 24 hours focusing on the issue – and what we can all do to help save the planet

theguardian.com

Retweets

11 like

It's quite a chilling account of living on the front line of rising sea waters.

“Climate change impacts are real and obvious. On my first day in Bairiki, I walked along the beach behind the President's house. The sea wall was broken in several places, and the beach was littered with rubbish. I couldn't understand where all the rubbish came from – were the broken TVs from passing cruise ships or something?

“My I-Kiribati colleagues explained that the rubbish on the beaches had mostly come from people's houses. With the highest point on Tarawa only 3m above sea level, **storm surges and king tides flood homes, pulling people's property back with them.** Over the following weeks and months, the sea dumps its takings back on the beaches.”



Stumps of dead palm trees lie beside the road to Tebikenikoora village. During high tides the village gets flooded and people's homes, most of which are built on stilts, become temporary 'islands'. Photograph: Vlad Sokhin/Unicef Pacific

David Tong said that a storm surge following Cyclone Pam flooded South Tarawa's maternity hospital, with flooding reaching hundreds of metres inland, killing pandanus trees and destroying taro pits.

"I heard talk of people putting sugar in their water, to counteract the salty taste. ... Already on Abiang, the nearest outlying island to Tarawa, salt water is bubbling up from the soil at king tides."

I-Kiribati are working to develop salt-resistant crops, and President Mamau has pledged to make a plan for every community and every island. "Our choices in the rich world will decide whether that's possible," said David Tong, who's returning to Kiribati in February: "The place gets under your skin."

6m ago
01:16

We're going to wrap up our Q&A with Jason Roberts in Antarctica now. Thanks to everyone for all the excellent questions. And thanks especially to Jason for taking the time out of his research down there to engage with us all. Apologies to those answers we didn't get to.

To close it off, here's one last question and answer.

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DrRossH @DrRossH

@MikeySlezak Is Antarctic volume being affected by climate change. The deniers all say ant ice is increasing.

1:17 PM - 20 Jan 2017

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And Jason's answer:

This is a question that we hear often, and it's great that people are still asking it, and want to know the answer. There is some confusion around this due to the changing amount of sea ice, and confusion between it and grounded ice.

The area of sea ice is changing, due mainly to changes in the ocean currents and wind, moving the sea ice around and packing it together in areas. The ice on Antarctica (the so called grounded ice) is decreasing.

Like any big land mass, things vary from area to area, but overall Antarctica is losing ice. We have several independent lines of evidence to support that. The most direct way is that satellites and aircraft (including the project I'm currently in Antarctica working on) measure the height of the surface of the ice sheet using lasers and radars. They show that many of the outlet glaciers and surrounding ice catchments are lowering, which can only happen if they are losing ice. The second way is that the gravitational field of the ice can be measured from space, we can "weigh the ice sheet" and it is weighing less over time.

Again like any big area, things can change from year to year, but overall the pattern is that Antarctica is losing grounded ice, and especially the smaller (and therefore quicker to respond to any changes) West Antarctic region.

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17m ago

01:04

Mike Bowers

Kiribati has a permanent population of around 100,000, over half live on the densely populated South Tarawa. Fresh water is drawn from wells that tap into a "water lens" which is a convex layer of fresh water that lays on top of the denser salt water.

It is usually the only source of fresh water. But as sea level has been rising, the salinity of the water lens on some of the outer atolls has made it unusable for human consumption.

This photograph shows children bathing in one of these shallow wells in South Tarawa.

Photogr



aph by Mike Bowers Photograph: Mike Bowers for the Guardian

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17m ago

01:04

HOUR 18: Rounded out with a jellyfish

Elle Hunt

Over the last 60 minutes –

Readers have had their sometimes fairly technical questions about Antarctica answered by **Jason Roberts** via email, direct from Casey Station – thanks to Jason and the Australian Antarctic Division for their contribution

Roberts [commented on the seasonal closure](#) of the British Antarctic Survey's Halley VI research station on the Brunt Ice Shelf, announced earlier this week as a result of uncertainty over cracks in the ice

We [flagged a march](#) in Sydney on Saturday, organised by Greenpeace Australia to coincide with **Donald Trump's** inauguration

Mikey Slezak and **WWF Australia** [together made you](#) *even more aware of*

penguins on Penguin Awareness Day (let us know when you'd like us to stop)

Mikey [let his professionalism give way to panic](#) (and let me just say, if Mikey's panicking – so should the rest of us)

Responding to **Eleanor Ainge Roy's** report from New Zealand, a reader shared a graph of 400,000 years' data to show that the worst [may be yet to come](#)

And we heard from **Lisa Gershwin** about how climate change may affect jellyfish

To come: reporting from Australia and we'll venture into Asia.

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24m ago

00:57

Elle Hunt

Matthew2012

19 January 2017 10:05pm

I see we are being offered access to some poor scientist stuck out in Antarctica.

<https://www.theguardian.com/world/2017/jan/06/giant-iceberg-poised-to-break-off-from-antarctic-shelf-larsen-c>

<https://www.theguardian.com/world/2017/jan/17/british-antarctic-station-halley-vi-to-shut-down-winter-crack-in-ice>

I bet he is having a cracking time :(

As **Matthew2012** references below the line, a British research station in Antarctica has [decided to relocate its 16 staff](#) who were due to stay there over winter due to uncertainty over growing cracks in the ice.

The British Antarctic Survey said in a statement on Monday that the Halley VI research station would shut down over winter due to concerns over changes to the Brunt ice shelf. A station relocation further inland away from the chasm [is already underway](#).

Jason Roberts says:

Yeah, I saw in the news about Halley VI research station having to close down over winter. The biggest factors working in Antarctica are safety and looking after the environment. You are a long way/time away from any outside help, so you need to do things properly and in a safe manner.

I have never visited Halley, but imagine that it has been designed so that it can be closed down over winter and then brought back into operational order next

summer, when conditions will be more favourable. The three Australian Antarctic research stations are built on rock, so luckily we don't have to deal with this issue. I wish our British colleagues every luck with the relocation of Halley.

BettyLousGettinOut

19 January 2017 10:10pm

Do you remember when we couldn't get access to the Guardian journalists Alok Jha and Laurence Topham because they were stuck in ice while reporting on, er, the lack of ice and they had to be rescued from the ice whose absence they had gone to report?

Thanks to **BettyLousGettinOut** for [bringing this story](#) from 2014 to my attention. I feel quite grateful to be reporting in relative comfort from the office in Sydney (today: overcast, grey).

Rescue from Antarctica

[Read more](#)

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27m ago

00:54

I've been in touch with Australian Jellyfish expert, Lisa-Ann Gershwin – Director of the Australian Marine Stinger Advisory Services.

[View image on Twitter](#)

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Michael Slezak



@MikeySlezak

I just got this excellent photo from Jellyfish expert [@LisaGershwin](#): "Here's a photo of me working hard in my Jellyfish-bloom office."

1:41 PM - 20 Jan 2017

11 Retweet

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She's written [this Facebook post for us](#), discussing the threat of Jellyfish taking over as the climate warms. While there's been a lot of talk of jellyfish doing well and filling the oceans, she says not all jellyfish will be winners.

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31m ago

00:50

Elle Hunt

Another answer from Antarctica.

Matthew2012

20 January 2017 12:04am

@ Jason Roberts

"The last time we were in what's called an interglacial - when we didn't have the big ice sheets in the northern hemisphere - that was about 120,000 years ago when the climate was about what it's like now," Roberts says.

This is perhaps an opportunity to clear up a question I had which is the ice cores are of very different lengths with Epica Dome C being the most noted at 800,000 years.

Is the reason that we don't have ice cores longer than 123,000 years in Greenland because :

A) there is believed to be no permanent ice then?

or

B) simply that the ice sheets moved at this time breaking the usable cores?

or

C) pressure and geothermal energy has melted the ice from below?

Jason Roberts said:

That's a very good question, and slightly outside my field of study, which is strictly Antarctica, but I'll have a go at answering it. I think there is some evidence of older ice in Greenland than 123,000 years, but none that has been successfully recovered in an ice core, and more importantly dated. In general Greenland is much closer to

the equator than Antarctica, and is more sensitive to warming air temperatures, so we think that during extended warm periods it would be a much smaller ice sheet and not extend to the coast like it currently does.

When you drill an ice core, because of the way the ice had flowed over tens of thousands of years, the layers of ice that fell in any year get thinner and thinner, making it much more difficult to date the bottom of an ice core. In addition, the ice slowly moves so it can get folded up (think of the patterns you can see in rocks in road cuttings), and this disturbance in the ice at the bottom can make it very hard to use the very bottom of an ice core.

Another factor for Greenland is that it is much smaller than Antarctica, so it just takes less time for the flowing ice to move to the edge and be lost to the ocean. So the ice gets replaced over much shorter timescales than in Antarctica.

The geothermal energy question is good. In fact there is liquid water found at the base of Greenland in places, including the NEEM core which reached the folded ice from the last interglacial period. So yes, this is also a factor – mostly it is just a question of how long it takes for new snow to completely move to the bottom of the ice and get discharged at the edges.

Trust that answered your question, **Matthew2012**. I must admit, I'm impressed by the level of technical knowledge being displayed below the line...

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34m ago

00:47

Elle Hunt

Below the line, **Erik Frederiksen** has responded to a quote from **Dr Sharon Hornblow**, a natural risks analyst from the Otago Regional Council, in **Eleanor Ainge Roy's** [report from Dunedin](#), New Zealand.

Erik Frederiksen

19 January 2017 11:45pm

From the article:

Dr Sharon Hornblow, a natural risks analyst for the Otago Regional Council.

“With the issue of sea-level rise we are looking at big storms increasing in frequency and severity...so people that would ordinarily have a fairly low risk of being flooded by the sea may now expect that adverse event to happen every ten years rather than every 100 years.”

Here's a graph of the last 400,000 years of global temperature, CO2 and sea level rise.

Notice how far CO2 has blown off the graph, and hence how far temperature and sea level have to rise to equilibrate with just our current forcing.

We could blow much further off that chart.

(The graph of 400,000 years of data Erik meant to link to is [here](#).)

Eleanor noted that 2016 was the hottest year on record for New Zealand, with droughts in the North Island and 11m of rain on the west coast of the South Island.

Eleanor is based in Dunedin and says the southern university town is being seen as a litmus test for how the rest of the country may fare in the coming years, with numerous flat, low-lying beach side communities built on marshy land mere metres above the sea.

“It all comes down to the fact that New Zealanders love to live by the ocean,” Dr Hornblow told Eleanor. “But if we were planning those homes with the wisdom we have today, we would not have people living there at all, or be building on those flat areas so close to the sea.”

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43m ago

00:38

I don't normally write about personal things, but recently I've been thinking about people's emotional responses to the devastation that climate change has been causing – and will cause in the future.

For years I've understood the crisis we're facing, but I've managed to maintain a kind of professional distance from it – not feeling enormously strong emotions about it.

But recently that's change. [Here](#) are my thoughts about why.

Writing about climate change: my professional detachment has finally turned to panic

[Michael Slezak](#)

I've maintained a wall between my job and my emotional response to it, but this month I've felt dread rising about looming disaster, and it's an awakening

[Read more](#)

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50m ago

00:31

A question from Twitter this time, about a reported increase of ice and snow in Antarctica.

[Follow](#)

Ben Cobbett @jabberwock359

@MikeySlezak Hello. A question for Jason Roberts in Antarctica: Is there actually an increase of ice/snow there or was that just a 'blip'?

1:05 PM - 20 Jan 2017

Retweets

likes

Jason Roberts responds:

Like anything involving such a big area as Antarctica, things vary a lot across the continent. From an Australian context, just think about floods and bushfires happening at the same time.

In general Antarctica as a whole is losing some ice, with this mainly happening in West Antarctica (the bit on the South American side of the Trans Antarctic Mountains). On the larger East Antarctic side, things are a bit more in balance, with some areas losing ice, and some currently gaining ice through extra snowfall.

Of course getting detailed measurements is difficult in Antarctica (there are only a few weather stations) so we rely a lot on satellites to make these measurements, so there is some uncertainty about just how large some of the changes are.

To make things harder, things are changing with time as well – again, just think in an Australian context, some years are wetter than others.

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1h ago

00:26

In Sydney Australia, there is going to be a march on the first full day after Trump is inaugurated. Greenpeace and other NGOs will be there [marching](#) to demonstrate on both climate change, and women's rights.

Updated at 12.29am GMT

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1h ago

00:25

Another missive from the Casey Station on Antarctica.

CgGc13

19 January 2017 11:16pm

I have another set for Jason!

Also in the news, there appears to be more sea ice around Antarctica. Can you please explain how a warming climate can cause "more" sea ice to be present? What does this mean to the ice on the continent?

Jason Roberts:

That's an interesting question about the sea ice, and one that keeps coming up.

While the air temperature and temperature at the surface of the ocean is important in forming sea ice, probably the biggest factor controlling how much sea ice is around Antarctica is the ocean currents (and the wind patterns over the water). These move the sea ice around, and can cause it to build up in certain areas as it all gets pushed together. Once this happens, it can influence the ocean, for example waves get damped out by the sea ice, which stop them breaking up the sea ice. So it is more to do with the changes in ocean and wind patterns than temperature.

There isn't much direct coupling between the changes in the sea ice and ice on the continent. Most Antarctic sea ice is only one year old (although there are areas of so-called "multi-year sea ice"), while the ice on the continent is much older, tens to hundreds of thousands of years. The things that affect the ice on the continent are the amount of snow that falls to replenish it, the air temperature over summer for melting it, and how stable the ice shelves are that help hold back the glaciers.

Keep your questions coming below the line.

[Facebook](#)

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1h ago

00:21

WWF Australia has jumped on the penguin awareness day bandwagon too, and included a some punny jokes in [their Facebook post](#).

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1h ago

00:18

Elle Hunt

Jason Roberts of the Australian Antarctic Division has replied to **CgGc13**'s question below the line on the impact of the breaking up of

the Lambert ice sheet.

CgGc13

19 January 2017 11:12pm

Questions for Jason Roberts when he comes on. In recent news, the Lambert ice sheet (shelf) is setting up to break apart again. When this goes, what will the result be for West Antarctica? Do you see this having any impact on the much larger East Antarctic ice sheet?

Jason says:

The ice shelf that has a major rift in it is the Larsen ice shelf. Parts of this ice shelf collapsed around 10 years ago, that time is just disintegrated, while this time in looks like calving a big iceberg. The previous collapse reduced the forces holding back the glaciers that feed this ice shelf, and the speed up (more than doubling their speed) in the following years, although I think the most recent studies are showing that they are starting to slow back down. We can probably expect similar behaviour when this shelf calves this time.

On a global scale, the glaciers feeding the Larsen are fairly small and don't contain a huge amount of ice. But their significance is more that they are the canary in the coal mine, showing us how vulnerable these ice shelves are to changes in the surrounding ocean.

1h ago

00:03

HOOR 17: Answers from Antarctica

Elle Hunt

Another hour has passed – here's what we've covered:

20 January being Penguin Awareness Day, [we've duly raised your awareness of penguins](#) (let us know below the line if you'd like to be made more... aware)

We heard how residents of the [Solomon islands are working to strengthen](#) forests, mangroves, reefs and other natural ecosystems that provide natural barriers to climate change

How a seawall constructed in 1880 in Dunedin, in New Zealand's South Island, has [proved an inadequate barrier](#) given contemporary challenges

The Australian Antarctic Division's [Jason Roberts on his daily flights out over Antarctica](#) – and what he sees

And a selection of your thoughtful, interesting comments – please keep them coming!

As Mikey mentioned, we're about to hear from Jason for a real-time interview conducted – hopefully not-at-all haphazardly – between the Casey Station on Antarctica and the Guardian offices in Sydney.

We've passed a selection of questions you've already left for him in the

comments, but do send on some more.

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1h ago
23:50

As mentioned below, we have **Jason Roberts** on standby at Casey Station in Antarctica ready to answer your questions about his work (see previous post), about Antarctica, or anything else!

Fire your questions at us in the comments below or tweet them to me at [@mikeyslezak](#). We'll get them to Roberts and post the answers shortly.

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2h ago
23:47

Jason Roberts is currently living and working at the Australian Antarctic Division's Casey Station on Antarctica.

Speaking exclusively with the Guardian this week, Roberts explained why he takes a plane out over Antarctica each day, measuring what's underneath the ice.

Play

Current Time

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Duration Time

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Fullscreen

Interview: glaciologist Jason Roberts in Antarctica

The work is trying to understand what controls changes in the ice, as the climate warms.

“The last time we were in what’s called an interglacial - when we didn’t have the big ice sheets in the northern hemisphere – that was about 120,000 years ago when the climate was about what it’s like now,” Roberts says.

“And all the evidence from around the world suggests that sea level was several meters higher than where it currently is.”

But where exactly all that sea level rise came from is a mystery Roberts is trying to solve. Check out the interview we prepared earlier.

NOTE: We have Roberts on standby, ready to answer your questions. Leave them in the comments below, or tweet them to [@mikeyslezak](#) and we’ll come back here with his responses.

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2h ago

23:44

Elle Hunt

This comment, from **NoMoreMrNice**, praises the live blog form as a means of capturing the complexity of climate change. (In the interests of balance, I’ll try single out some critical comments soon, don’t worry!)

NoMoreMrNice

19 January 2017 10:54pm

Thank you for this; I've had a full on day at work, so am only catching up on it now, but it's very worthwhile and has been well done.

One benefit of this approach is that it reflects the complexity of climate change. Stories on one aspect are often bedeviled by comments of the 'what about...' nature. It's very hard to keep seeing the issue in the round, as a political, personal, societal, scientific and economic risk and opportunity. But it's so important to see how the parts do fit into the whole. Thank you.

As NoMoreMrNice notes, one of the challenges of reporting on climate change is making it seem like an immediate issue that’s unfolding now, rather than something intangible, far away in the future. These real-time, around-the-world updates are giving – if you’ll excuse the buzzword – a holistic view of the problem.

A few commenters have suggested that we should run the blog for another 24 hours, or at least do so more regularly – though it’s dependant on resourcing

of our offices in London, New York and Sydney, the warm response below the line is certainly an incentive to do so!

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2h ago

23:38

Eleanor Ainge Roy

St Clair beach in Dunedin is threatened by sea level rise.

The first seawall was constructed in 1880 to protect the homes and businesses of low-lying South Dunedin, land which experts say should never have been built upon.

The original seawall is evident in this picture, and was made of loose rocks and debris. The current wall is made of concrete and is six metres high. It is a great place to eat fish and chips while watching the pacific ocean hurl itself against the man-made barrier.



Image of St Clair Beach, Dunedin, 1880 Photograph: DunedinNZ

“We have a duty and responsibility to inform people about what risks they face living in a coastal environment,” says Dr Sharon Hornblow, a natural risks analyst for the Otago Regional Council.

“With the issue of sea-level rise we are looking at big storms increasing in frequency and severity...so people that would ordinarily have a fairly low risk of being flooded by the sea may now expect that adverse event to happen every ten years rather than every 100 years.”



Image of St Clair Beach, Dunedin, 1912 Photograph: DunedinNZ

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2h ago

23:31

Elle Hunt

Thanks for all your comments below the line – it’s great to see so lively a discussion. This, from **Uli Nagelb**, was interesting in light of earlier debate over reference to “climate deniers” in the US:

Uli Nagel

19 January 2017 11:12pm

Very good initiative! I think the conversation here in the US is shifting - it seems that even previous climate deniers (Pruitt, Zinke, Perry) are now saying that climate change is real, however, they are not willing to say that it is entirely human induced and can be controlled by changing our behavior fast. We need to address that point more than just the fact that the climate is changing. And the idea of showing positive actions around the world is very good! Maybe another 24 hours! Thanks for all you do!

Earlier in the blog, we referred to “climate sceptics (or doubters, if you prefer that word)”; challenged in the comments, my colleague **Emily Wilson** had

this to say:

[Emilyhwilson](#)

19 January 2017 7:18am

I'm told even the word 'sceptic' is extremely toxic in the US

It goes to show how loaded this debate continues to be in the face of apparently indisputable facts. The question of how to bridge the gaps between the two groups remains, as pointed out in this highlighted comment:

[dandharvey](#)

19 January 2017 1:43pm

This comment has been chosen by Guardian staff because it contributes to the debate Great effort by the Guardian, but there's obviously a problem of preaching to the converted. What are the best ways to persuade the skeptics?

That's something that we aim to keep at the forefront of our minds in our coverage of climate change, far beyond singular initiatives such as these. (While it's great to see the suggestions we keep the blog going for longer, I don't think **Mikey Slezak** would be very happy with me for committing to another 24-hour stint – as passionate as he is about rising seawaters.)

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2h ago

23:17

Eleanor Ainge Roy

Last year five islands in the Solomon islands [were consumed by rising oceans](#). The impoverished Oceanic nation, home to 640,000 people, has seen annual sea levels rise by as much as 10mm in the last 20 years; Choiseul Province, home to 20,000 people, was forced to relocate its provincial hub.

Five Pacific islands lost to rising seas as climate change hits

Six more islands have large swaths of land, and villages, washed into sea as a result of 'dramatic impact of climate change' on the Solomon Islands

[Read more](#)

Fred Patison, the country manager for the Secretariat of the Pacific Regional Environment Programme, says residents of Choiseul were attempting to strengthen their ecosystems to reinforce their natural safeguards against climate change.



Fred Patison, the Solomon Islands country manager for the Secretariat of the Pacific Regional Environment Programme Photograph: Fred Patison

Speaking via Facebook messenger from his office in the capital Honiara, Patison says the Solomons have limited resources, so helping the local people preserve and care for their native forests, reefs and mangroves is the most straightforward action.

“Ecosystem-based adaptation” is, for now, affordable and easily communicated – “although at some point relocation may become an option.”

He adds that the Solomons were getting uncomfortably hot – a trend noted in other Pacific islands.



The remains of one of six partially eroded islands in the nation of Solomon Islands. Photograph: Reuters

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2h ago

23:07

According to Sydney Aquarium, today is penguin awareness day.

As they point out, penguins are threatened by climate change as ice melts and sea level rises.

Sydney Aquarium

(@Sydney_Aquarium)

[#PenguinAwarenessDay](#), did you know that the curious birds are under threat from [#GlobalWarning](#) but also plastic pollution from humans?

January 19, 2017

And for your enjoyment, the Australian Antarctic Division have posted this adorable video of penguins being, well, penguins. (And soon we'll be heading to Antarctica, hearing from a scientist working there right now.)

Antarctic Division

(@AusAntarctic)

Happy [#penguinawarenessday](#)! Adélie penguins are determined walkers averaging 2.5 km/h. Join our Q&A 1-2pm AEDT at <https://t.co/WUlx7WwSnm> pic.twitter.com/BDPpGKKrJI

January 19, 2017

Updated at 11.12pm GMT

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2h ago

23:06

HOOR 16: Into the Asia Pacific

Elle Hunt

Good morning from Sydney, Australia – my name is **Elle Hunt** and I'm helping **Mikey Slezak** co-pilot the blog in its final eight-hour stretch.

In the past hour, we've learned about:

[the impact of rising sea levels](#) in the low-lying Pacific island of Kiribati

how much greenhouse gas the world is emitting *right now* ([warning: this carbon countdown clock](#), updating in real time, may spike your anxiety)

the latest on the toxic debate about renewable energy in Australia. The good news: [voters aren't convinced](#) that it's forcing prices up

Coming up, we'll head to Antarctica with **Jason Roberts** of the Australian Antarctic Division, who will be joining us for a real-time Q&A from 11am AEDT.

Watch his upcoming video interview and let us know what questions you have for him in the comments or on Twitter: I'm @mle_elle, Mikey's @MikeySlezak, and the hashtag we're using is #GlobalWarning.

Thanks for joining us.

Facebook

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3h ago

22:44

Here in Australia, there's been a toxic debate about renewable energy. The fossil fuel industry, conservative media and the coalition government have been trying to link blackouts in South Australia, which have been caused by extreme weather, to the high proportion of renewables in that state.

They've also been arguing that rising power bills around the country are a result of increases in renewable energy in the grid.

But today, just as another extreme storm causes a large blackout in South Australia, we have polling from GetUp showing Australians have not been swayed by these arguments.

Just over 17% of voters said they thought renewable energy was to blame for rising power prices.

Read the full story here:

More voters blame energy price rises on privatisation than renewables – polling

Only 17.7% of respondents in polling commissioned by GetUp believe renewable energy is the primary culprit

[Read more](#)



A large table coral is severely bleached at Scott Reef. Research divers are assessing the extent and severity of the bleaching by conducting surveys at several sites across the reef. Photograph: AIMS/Nick Thake

3h ago

22:35

Nick Evershed

This clock estimates how much greenhouse gas the world is emitting right now – and how much we have left to emit if we want to keep global warming within the 2C band considered crucial by scientists to prevent serious damage to the planet.

I've calculated that in just the 24 hour lifespan of this blog, the world will pump out more than 112m tons (CO₂-e).

You can embed the clock on your own website as well by using the code from the embed button (that's the purple one with `</>` as the symbol).

Updated at 10.35pm GMT

[Facebook](#)

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3h ago

22:23

First up, we're starting in the low-lying island of Kiribati. My colleague [Eleanor Ainge Roy](#) has filed this from New Zealand:

Kiribati's climate change officer **Choi Yeeting** says there are no climate deniers in his island home - because the population of 100,000 people in the central Pacific ocean see the devastating effects of climate change everyday, which in this low-lying atoll nation include rising sea-waters, extensive coastal erosion, increasing temperatures, prolonged droughts and severe fresh water shortages.

"Technically speaking, we are planning ahead that one day we may have to leave our home," said Yeeting.

"But on the other side of that is a nationalist pride that comes with being an individual from Kiribati and not wanting to go down without a fight. People are trying to think positively and adapt, because leaving our home is the worst-case scenario."

Former President and renowned climate change activist **Anote Tong** says when there is a king tide and a moderate westerly wind blowing there is frequent damage to villages and homes, with crops destroyed and fresh water wells tainted.

During his time in office (which ended last year), Tong became famous in the climate change community for taking strong, preventative action to prepare his country for the worst, including building sea walls, buying "fall-back" land in Fiji if Kiribati residents were one day forced to migrate, and investigating the feasibility of building a floating island.

Tong is adamant that the initial purchase of the land in Fiji was an "investment decision" but since Kiribati's fate has become more dire, Tong says the Fijian government and its people have stepped forward with open arms.

"I have never been in support of our people being given the status of climate refugees. And the reason I say that is we have more than enough time to prepare. And I have always advocated a policy of migration with dignity." he says.

"But the Fiji government and the people have come forward to say Fiji would welcome people from Tuvalu, and Kiribati, if they should ever need a place to go to. And I think that is the moral response that I have been looking for from the international community. So that should be put on record for someone acting in a humanitarian, moral way to a challenge that is going to mean the destruction of homes, culture and

people.”

Updated at 10.31pm GMT

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3h ago

22:11

Before we move on – a quick update for new readers about what we’re doing here.

Just ahead of a climate sceptic moving into the White House, we’re producing 24 hours of reporting on climate change happening now.

We began with the blog being piloted from London, and had reporting from Europe, Africa and the Middle East.

The reins were then taken over by our colleagues in the US, who delivered reporting from the Americas.

And here we are now in Australia, bringing you reporting from everywhere between India and Kiribati.

It’s not all doom and gloom – we have reports about communities fighting climate change, about reasons to be hopeful and posts about what you can do to help limit global warming.

Keep checking back in and let us know what you’re thinking on twitter or below the line.

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3h ago

22:01

Michael Slezak

Hello from Sydney, Australia.

From the office here, we’re going to drive the blog for the next nine hours, taking it through to the 24 hour mark.

As the sun is now moving over the Asia Pacific, we’ll bring you reporting from Pacific Islands, New Zealand, Australia, China, Thailand, Cambodia, Mongolia, India and lots of places in between.

We’ll also turn to Antarctica, and give you the opportunity to fire questions to a climate scientist who is there now, in the middle of a major research project.

You'll hear from people living on the frontlines of climate change around the region, as well as people at the frontline of the fight against climate change. I'll be asking some leaders of the climate movement if having a climate denier in the White House, and little progress on climate action in Australia, is a sign the movement is failing.

I'll bring you a video interview with a scientist working on the frontline of climate change in Antarctica – and give you an opportunity to ask him questions for yourself.

But we want to hear from YOU.

Let me know what's happening with climate change around you, or how you might be preparing for it or fighting it. Tweet me @mikeyslezak or leave a comment below the line. We'll try to feature as many of your inputs as we can.

Updated at 10.05pm GMT

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3h ago

22:00

HOOR 15: scientists, refugees, coal and rainforests

As **Amanda Holpuch** and **Ashifa Kassam** reported earlier, climate change will have cascading effects from forests in the American south-east to the far reaches of Canada. Brazil's leading monitor of the Amazon told **Jonathan Watts** about the threat of cattle ranchers to the Amazon, and attorney Lauren Kurtz told **Alan Yuhus** about a campaign to help climate scientists protect themselves under the administration of Donald Trump.

We're also going to pass the baton to **Michael Slezak** and **Elle Hunt** in Sydney, Australia, for the final sweep of climate change coverage around the world

Fifteen [things you can do](#) to make a difference

Adam Gabbatt on [New York's rooftop solar farms](#)

[George Monbiot](#): 'Commentators seek glimpses of light in Trump's position. There are none'

The [world's biggest solar farm](#) springs up – in China

The ever-popular [climate quiz](#)

And the [climate clock](#), still ticking away

The Guardian

(@guardian)

Fact checking @realDonaldTrump: global cooling was a fringe idea #GlobalWarning
<https://t.co/3n8F5g9E3epic.twitter.com/LCithH8Ucy>

January 19, 2017

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3h ago

21:54

Jonathan Watts

More from Paulo Barret, head of Imazon, the world's leading monitor of the Amazon rainforest.

It has been argued that indigenous reserves have the best protected forest. Is that true from what you have observed?

Indigenous lands and many Conservation Units (such as National Parks and National Forest) are the best protected areas. The indigenous peoples that are more protective are the ones that maintained their ancient livelihoods practices, which are dependent on healthy environment such as hunting, fishing and small scale agriculture. By being present in the areas, they also prevent timber extraction by loggers. Unfortunately, Congress wants to amend the constitution to make it harder to acknowledge land rights for indigenous people. Yesterday, the Ministry of Justice announced that it would review all demarcations of this type by Funai (The National Indian Foundation), which will further politicise the process.

What more could be done in Brazil?

INPE, the National Space Agency, uses satellite images to report the annual rate of deforestation and also to produce monthly alerts on hotspots of deforestation. Data from the latter – which is named DETER – is provided to the federal environmental agency to guide field inspections. Overall, the system works well, but in the past three years the government stopped publishing DETER's data to the general public. The new Environment Minister has promised to resume monthly publication.

The government should also resume the policies that had been effective including improving enforcement, implement and increase the area of Conservation Units. Additionally, government and private sector should work more on incentives for conservation, especially for small landholders. Finally, government should collect the land tax that would curb speculative deforestation and land grabbing.



Lagoons during dry season in the Pantanal, Brazil Photograph: Mint Images - Frans Lanting/Getty Images/Mint Images RM

Looking 20 years into the future, what are the best and worst case scenarios for the Amazon?

The best scenario would combine the implementation of policies that have been effective with new ones, such as incentives for conservation, with the aim of keeping the existing forest. But it is also necessary to invest in restoration given that Brazil has an estimated 28 million hectares of legal forest deficit in the whole country – about half of that in the Amazon. However, Brazil has promised to reforest only 12 million hectares up to 2030 as part of the Paris Climate Agreement.

The worst scenario would be the continuation of weak government and a private sector that fails to understand the importance of forest conservation to sustainable development and fails to execute their stated commitment to zero deforestation. In that case, deforestation and forest fires would continue and we could lose 30% by 2050. That would take the forest to turning point, after which it could lose the capacity to regenerate due a combination of drier climate and frequent forest fires.

Personally, are you optimistic or pessimistic about the prospects for the Amazon?

I am very concerned because of the financial and political crises in Brazil that are likely to last for several years. To offset this, the private sector and the international community should increase their support for forest conservation. For example, large corporations that committed to zero-deforestation should work closely with Brazilian authorities and landholders to curb deforestation.



A deforested area is seen near Novo Progresso, in Brazil's northern state of Para. Photograph: Andre Penner/AP

Updated at 10.02pm GMT

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3h ago

21:48

Jonathan Watts

The Amazon contains half the world's remaining rainforest, with an estimated 390bn trees doing the work of storing carbon and regulating the climate. Deforestation is removing those natural air filters.

Early this century, an area the size of Albania was being cleared every year. Since then, the good news is that Brazil, which contains 60% of the Amazon, has taken action to slow deforestation. But pressures on the forest are growing again. I asked **Paulo Barreto**, the head of Imazon, the leading independent Amazon monitoring organisation, to give me an update on the situation.

Your organisation uses satellite data to measure deforestation. What do the recent results tell us?

The rate of deforestation decreased nearly 80% from 2005 to 2012. But from 2012 to 2016, deforestation rates increased 75% going from 4,571 to 7,989 square kilometres.

Can you explain why progress has faltered?

Deforestation rates increased because after 2012 Congress and the government weakened the environmental laws by pardoning some of

the illegal deforestation, reduced Conservation Units, built large infrastructure project without proper environmental licensing procedures and decreased the enforcement of environmental law.

An [interactive map](#) by Global Forest Watch tracks the change in forest cover since 2001. It is impressively grim. The pink (decline) areas are far more prominent than the blue (increase) areas. What does this mean for the climate?

This means that the Amazon is a large contributor to climate change by emitting greenhouse gases when the forest is burned. In fact, deforestation is responsible for about half of the Brazilian greenhouse gas emissions.

Which areas have the most rapid deforestation ?

Cattle ranching accounts for 65% of the deforested areas in the Amazon. Deforestation is facilitated by large infrastructure projects, which facilitated transport and attract immigration. In the past five years, this has happened near Belo Monte dam in Altamira and along the BR-163 highway in eastern Pará State and near Porto Velho, Rondônia State, where two dams have been built.

On a more positive note, which areas are seeing reforestation ?

Most reforestation has been by natural regeneration of forests in abandoned pasturelands. Usually, these lands are in areas with poor potential for land use intensification such as riparian areas or zones with high rainfall.



Forest and Fields, Brazil July 18, 2016 Farms and pastureland carve their way into tropical forestland in the

Western Brazilian State of Rondônia. The state is one of the Amazon's most deforested regions. Photograph: Planet

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3h ago

21:41

Throughout his presidential campaign, Donald Trump promised to “[save](#)” coal mining, holding rallies where he mimed shoveling and accused Barack Obama of doing “everything he can to kill the coal industry”. Surrounded by advisers who oppose climate regulations, Trump will soon be able to hack through the rules put in place by Obama to curtail pollution. Saving coal, however, is likely out of beyond his powers.

The free market, far more than regulations, has done the work of killing coal. Despite Trump's insistence that the US is struggling for energy, the natural gas industry has created a supply glut so significant it has cut deeply into the economies of entire nations, Saudi Arabia and Russia among them.

Coal couldn't compete. Cheaper and cleaner than coal, though – not renewable or green – natural gas operations mushroomed all over the US over the last decade, so much so that they started [creating earthquakes](#) and [short-lived boomtowns](#). Trump's proposals would open up the US for even more gas exploration.



An explosive is detonated at an A & G Coal Corporation surface mining operation in the Appalachians in 2012.

Photograph: Mario Tama/Getty Images

Coal only accounts for about 30% of US electricity, down from about 50% in 2008, and its decline traces back several decades. The industry

has [lost about 200,000 jobs](#) since 1980 as machines replaced humans in the mines, and as those mines delved into deeper, more expensive and dangerous mountains. Exports peaked in 2012, alongside the high points of growth in China, which has its own coal supplies and has now turned toward cleaner energy. Investment banks have also [continued to back away](#) from the industry as renewable technology has become cheaper.

Coal doesn't help the poor; it makes them poorer

Dana Nuccitelli: Climate denial often centers around myths about the importance of coal in alleviating poverty

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52s ago

21:36



Uccilia Wang

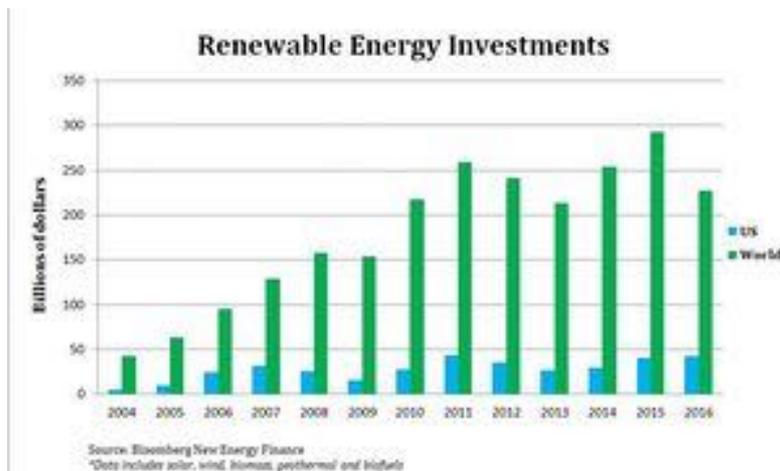
Clean energy is a [hot topic](#) for the political and business bigwigs who gather in Davos for the World Economic Forum this week. The forum has added more sessions on the subject (along with climate change) than ever before.

That's not surprising, given that solar and wind energy no longer represents mostly a badge of environmental activism. We are seeing an [increasing number of companies](#), including Google, Apple and Ikea, that sign contracts to buy renewable electricity or even build their own solar and wind farms. That's because the prices for these once-expensive sources of energy have dived since 2009, with [63% drop for solar contracts](#) in the US over the past five years.

Renewable energy investments, which also include geothermal and biomass, increased from \$40.1bn in 2015 to \$42.7bn in 2016 in the US, according to a new report by Bloomberg New Energy Finance.

Solar being cheaper than coal? This was once unthinkable. Now, it's already happening in some corners of the world and could spread to

just about everywhere by 2025.



Energy investments. Photograph: Bloomberg New Energy Finance

Comments

3m ago

21:29



Mark Oliver

Ashifa Kaseem, the Guardian's Canada correspondent this week sent us [this dispatch](#) from Lennox Island, off the coast of Prince Edward Island in eastern Canada. On Lennox, she wrote, the island has lost 400 acres in just a few generations and the First Nations community is wondering if it has a future.

Kaseem reports that over the past three decades, Danny Tuplin has watched the island's shoreline inch closer to his two-storey house. Only a few years ago, his home sat 10ft from the water. Then in 2004, a hurricane-strength nor'easter blizzard brought the ocean to his doorstep. "I went out the back door, I took five steps and I was in salt water," said the 58-year-old.

Touching on similar issues, we have a comment piece by Julian Brave NoiseCat, an enrolled member of the Canim Lake Band Tsq'escen in British Columbia, who says the cornerstone of the climate justice movement must be indigenous rights and sovereignty.



Aerial view of Lennox Island, Canada Photograph: The Government of Prince Edward Island

Earlier today we [published this piece](#) by Brave NoiesCat in which he writes:

“Many believe the fight to combat climate change hinges on the aligned interests of capital and state. Give the Elon Musks of the world enough time and resources and they will innovate us out of impending climate catastrophe. Get the G20 in a room and they will hammer out a deal and create regulations to enforce it. Or so the thinking in some circles goes. Yet throughout history, the interests of the state have slid into alignment with big oil and big profits rather than lining up with our rivers, our air, our wildlife and our people.

On Friday, men who disavow climate change and profit mightily from fossil fuels will take charge. In a global race to the bottom, there’s no telling how far downriver these shortsighted profiteers will sell our future generations.

Elsewhere on our Comment site today, commissioned for our climate blog, we have a [piece](#) by Osprey Orielle Lake, who is marching against Trump on Saturday and argues there is a link between violence against women and the Earth.



Lennox Island, off the coast of Prince Edward Island, Canada. Photograph: Ashifa Kassam for the Guardian

5m ago

At the largest gathering of earth scientists in the world last month, a few lawyers had set up a booth stacked with small books for any researcher who would take it: legal advice for how to protect yourself from political persecution. “We’re worried about a lot of things,” said Lauren Kurtz, executive director of the Climate Science Legal Defense Fund, adding that some scientists had received legal and even death threats.

“We have people in power who’ve used legal bullying in the past,” she added, alluding to president-elect Donald Trump’s [history](#) of using expensive lawsuits, or [at least the threat](#) of them, to attempt to silence critics. “That sort of legal bullying is going to be seen as much easier to do.”

A handful of scientists have already been targeted for their work. Dr Michael Mann, currently a professor at Penn State, was sucked into a long-running legal suit when a rightwing activist group sued the University of Virginia, his former employer, to access tens of thousands of his emails. Scientists at the University of Arizona are currently [enmeshed in a similar fight](#), and last year representative Lamar Smith, a Texas Republican, [tried to subpoena scientists](#) at the National Oceanic and Atmospheric Administration. “Their argument is basically if you get the emails you’ll get the full meat of research, whereas it’s actually a way for them to take words out of context.”



Smith. Photograph: Scott J. Ferrell/Congressional Quarterly/Getty Im

Barack Obama's White House defended the climate scientists' research; scientists now fear that the Trump administration will leave them at the mercy of lawmakers and activists with an interest in silencing scientists. In 2014 a court decided in Mann's favor, agreeing with him that turning over research emails chilled research; discouraged collaboration; and put scientists at a competitive disadvantage. The Arizona case [remains unresolved](#) after a victory by a group funded by several energy companies.

Scientists have also come to the legal group with fears for their professional future. They could be barred from grants or lose funding and effectively iced out of their own jobs, Kurtz said. "We worry about government suppression, where scientists can't do the same research, can't use the words climate change, modify reports to make it seem like it's not as drastic as it is."

Inside the largest Earth science event: 'The time has never been more urgent'

With Trump set to have a 'chilling effect' on environmental policy, 20,000 Earth and space scientists met in California to face up to a new responsibility

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In turn, she said, the team of attorneys has started to research

whistleblower cases, “if and when a scientist comes to us for those sorts of quandaries. A couple have stopped by to say, ‘Hey, I am employed by DOE another one by USGS. I was going to retire and now I’m not going to, because I feel like there’s a need for me to be on the front lines and fight back.’”

Much of the data from federal agencies is already public, and some scientists have already begun “guerrilla archiving” to back up the climate data on non-government servers. “Who knows what will happen with the Trump administration,” Kurtz said. “They may do all sorts of back-door things. I don’t think the Trump administration is going to be super pro transparency.”



Eric Holthaus

(@EricHolthaus)

Scientists: Do you have a US .gov climate database that you don't want to see disappear?

Add it here:<https://t.co/1EN8OUc4Tr>

2m ago

21:17



Lauren Gambino

After Donald Trump was elected in November, the mayors of more than 60 US cities sent an open letter to the president-elect urging him to work with them on combating climate change. Trump's team has yet to respond to the letter, said Los Angeles mayor Eric Garcetti, a co-founder of the Mayor's National Climate Action Agenda.

Garcetti, who is in DC for the US Conference of mayors, said he is encouraged by the conversations he's had this week.

"Even a change of administration cannot take away our determination and our ability to continue our progress," Garcetti said. "Through different administrations and different congresses, most of the action has happened at the local level."

Garcetti said he spoke to the president-elect from the C40 Climate Summit in Mexico City last month. Though he wouldn't elaborate on details of the conversation, Garcetti described Trump as "open-minded" on the call.



Garcetti. Photograph: Fred Prouser / Reuters/Reuters

Boston Mayor Marty Walsh said he's hopeful the Trump administration will respond to the economic case for fighting climate change.

"This issue goes a lot deeper than Democrats and Republicans," Walsh said. "This goes into healthcare. ... These issues all of sudden are starting to become economic issues."

Extreme storms, wildfires and droughts, sea level rising and storm surges and air pollution are not just concerns for the mayors of big, liberal cities, Garcetti and Walsh stressed.

Climate change is "not an ideological issue but an urgent one for us, that transcends partisanship with undeniable science and more importantly undeniable human impacts".

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8m ago

21:11



Amanda Holpuch

As climate change causes parts of the earth to grow hotter and drier, it has also led to a recent surge in extremely destructive wildfires.

It is difficult to link specific events, like the devastating wildfires in Tennessee's Great Smoky Mountains last year, directly to climate change, but scientists found that a drier and warmer planet can increase the likelihood of wildfires.

“If you get conditions that are ripe for a wildfire across multiple places and at multiple times then wildfires will actually happen,” said [Auroop Ganguly](#), an expert on climate extremes and water sustainability in Northeastern University's Department of Civil and Environmental Engineering.



Wildfires blaze in Tennessee's Gatlinburg. Photograph: Jessica/ddp USA/Barcroft Images

But even as regions become more susceptible to wildfires, there still has to be a trigger, like arson, to start the blaze.

Ganguly compared this to a person's general health: if someone's all-around health is bad, he explained, that person is more susceptible to other illnesses. That person will also have a more difficult time fighting back against a sickness. Similarly, hotter and drier parts of the globe are more susceptible to wildfires and have a more difficult time responding to it.

And scientists say the planet could become more vulnerable to

wildfires.

Fire season was longer for more than a quarter of the Earth's surface from 1973 to 2013, [according to a July 2015 study published in Nature](#). The study also found that climatic changes are expected to increase fire season severity in the coming decades.



Businesses and vehicles along Cherokee Orchard Rd in Gatlinburg. Photograph: Michael P / ddp/Barcroft Images

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14m ago

21:05

So far, Donald Trump has said extremely little about how he would lead Nasa, whose administrator reports directly to the president, or the National Ocean and Atmospheric Administration, whose officials report to the secretary of commerce. Late in the campaign, Trump said he [hoped to “free Nasa”](#) from its logistics work in low-Earth orbit (which Nasa does little of) and instead “refocus its mission on space exploration”.

“Did you ever see what’s going on with space, with Russia and different places? And us? We’re, like, we’re like watching. Isn’t that nice? So much is learned from that, too.”

The main suggestion of Trump’s speech, alongside his repeated denial and skepticism toward the science of global warming, is that he intends to cut Nasa’s Earth science work. Bob Walker, an adviser to the president-elect, has [pushed the idea](#) of cutting all of Nasa’s climate research in favor of deep space exploration. Climate scientists have warned this would prove a savage blow to research efforts.



Wilbur Ross. Photograph: Manuel Balce Ceneta/AP

Trump's nominee for secretary of commerce is billionaire investor Wilbur Ross, who has not commented at all about how he would lead NOAA, protect US fisheries or guide climate science. Ross made his fortune, in part, by [rehabilitating steel and coal companies](#). Trump has not said who he would name NOAA's administrator; Obama's first pick for the post was marine ecologist Jane Lubchenco. The current administrator of NASA, former astronaut Charles Bolden, is expected to follow tradition for appointees when a new president takes the White House, and submit his resignation shortly after Trump is inaugurated.

Though NASA has generally enjoyed bipartisan support in Congress, it has a [\\$2bn Earth science program](#) that many scientists fear will suffer greatly under a Republican government stocked with many climate change skeptics and deniers. The space agency's planetary science programs may go untouched, but scientists also [fear that funding will stagnate](#) as Congress enacts new tax cuts and grapples with how to reconcile those with hugely expensive efforts to repeal healthcare reform and spend on infrastructure.

Thomas Zurbuchen, NASA's new associate administrator told reporters last month that he stands by the priorities and data he prepared for the incoming administration. "The principles we drew out are the principles that we would use in any administration," he said, adding

that he urged scientists to “focus on the data that we get and not amplify the noise.”

“Behave like scientists, and talk like scientists, passionately,” he continued. “Talk about science in away we know that’s affecting life on earth.”

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With Trump set to have a ‘chilling effect’ on environmental policy, 20,000 Earth and space scientists met in California to face up to a new responsibility

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19m ago

21:00

HOOR 14: climate change cuisine

As **Ucilia Wang** and **Jonathan Watts** reported earlier, climate change will affect just about every detail of daiy life, from your morning coffee to chocolate to a glass of wine. Later on we’ll hear how this increasing aridity is going to affect your meal – breakfast, lunch, dinner and dessert.

We’re also going to hear about the steps climate scientists can take to defend themselves in the age of Trump

Fifteen [things you can do](#) to make a difference

Adam Gabbatt on [New York’s rooftop solar farms](#)

[George Monbiot](#): ‘Commentators seek glimpses of light in Trump’s position. There are none’

The [world’s biggest solar farm](#) springs up – in China

The ever-popular [climate quiz](#)

And the [climate clock](#), still ticking away

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“ The concept of global warming was created by and for the Chinese – Donald Trump 2012



Fact / Scientists have been talking about climate change since the 19th century, China didn't have a national climate change policy until 2007



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Fact checking @realDonaldTrump: global warming is not a concept created by the Chinese #GlobalWarning

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25m ago

20:54



Uclia Wang

Renewable energy has long been considered a liberal cause championed by tree huggers on the ground and Democrats in governments. That political divide showed up in election campaign contributions historically as well. But during the 2016 election cycle, the solar and wind trade groups [gave more money to Republican](#) than Democrats running for federal offices for the first time, reported Reuters.

Their bets may pay off as they face a new administration with a new president who thinks solar and wind are expensive and sees wind turbines as bird killers that also [ruin views of his golf courses](#).

[Roughly \\$400,000](#) from wind and solar political action committees (PAC) went to dozens of federal election candidates. Among the Republicans are Senator Dean Heller of Nevada, Representative Tom Reed of New York and Senator Richard Burr of North Carolina, who together received more than [40%](#) of the federal campaign contributions from the Solar Energy Industries Association PAC.

That shift in money politics reflects the reality that many [red states](#) are home to large solar and wind farms. Take a look at the [top 10 states](#) with the most solar energy generation and you will find Arizona, North Carolina and Texas on the list. The [top wind energy states](#) include Texas, Oklahoma and Iowa.

Lobbying across political lines also makes sense because the country's energy market is made up of [more than 3,000 utilities](#) and regulated mostly by states. Local politicians, regardless of their party affiliation, are particularly keen to support businesses that bring jobs and tax revenues.



Why is corporate America picking wind power over solar?

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31m ago

20:48

Encroaching into homes and dinner tables, rich and poor alike, climate change plays no favorites – it will take your chocolate.

Cacao trees grow in rainforest climates that will only become drier in the next few decades, depriving the plants of the large amounts of water they need to grow. Research collated by NOAA and the IPCC suggests that climate change will force the best land for growing chocolate into higher altitudes, creating a slew of conflicts for farmers and industries, especially in Ghana and Cote d'Ivoire, where a huge amount of the world's cacao is grown. Over the last 40 years, the world's available land for cocoa growth has declined 40%; the temperature in Ghana and Cote d'Ivoire is expected to rise two degrees Celsius over the next 40.

Growers in some regions are trying to breed drought-resistant plants to survive the worsening conditions, while others are replanting sections of rainforest to mimic cacao's natural habitats, in a method called *cabruca* in Brazil. Coffee will fare even worse than cacao, suffering from the increasing heat as well as the aridity, and beer production, reliant on a large amount of water for processing hops, has already been affected at dozens of [breweries](#).



No more beer, chocolate or coffee: how climate change could ruin your weekend

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44m ago

20:35



Uclia Wang

Climate change has already encroached into grocery stores and restaurant menus, as it kills crops and makes it harder to keep fruit, vegetables and livestock alive. Global warming is also draining our drinks, including one of the oldest human libations: wine.

A warming climate **will affect the quality and yield** of the grapes, with mixed results around the world. Rising temperatures could **help growers in some regions**, for instance helping France in particular grow premium grapes.

But the same can't be said for California, the [biggest wine producing state](#) in the country. Rising temperatures, coupled with persistent drought and the likelihood of more extreme hot and wet days ahead, are gradually making the state [less habitable](#) for its notable varietals, including chardonnay and cabernet.

A plowed up grape vineyard in California. Photograph: Michael Nelson/EPA

Grape growers have been [taking note of the effect](#) of global warming. How they deal with it will influence the role the US is the global wine industry, where the country is among the top five [wine grape growing](#) and [wine-producing](#) nations.

Some vintners are using technology to help them cope. For example, they are [using sensors and drones](#) to monitor soil quality and planting more cover crops to retain moisture in the ground. They are turning to owls and falcons to fight the growing army of pests such as mice and voles. They are also recycling the precious water more, in some cases relying on [giant bins of earthworms](#) to do the job.

Global wine production expected to fall by 5% due to 'climatic events'

South America, particularly Argentina and Chile, likely to see biggest decline, which may concern fans of wines such as malbec

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20:24

Kevin Rawlinson

In London, the live panel debate is underway off at Guardian headquarters. A room full of members, readers and activists joins the actor and entrepreneur, **Lily Cole**, the author and academic, **Dr Jonathan Rowson**, and the Green party's science and technology spokesperson, **Esther Obiri-Darko**. Also on the panel are the chief executive of Friends of the Earth, **Craig Bennett** and the "renegade economist" **Kate Raworth**.

Opening the debate, the panel members discussed how to be about the political and economic change necessary to protect the environment. Cole told the audience that the most effective option for individuals was to vote with their wallets.

One of the main areas I've focused on is how I spend my money. I'm not perfect with it, I'm as guilty as most westerners of buying too much... But, because the

world is so driven by economics and so driven by money right now, the only way you're going to communicate to businesses is by starving their bottom line.

Obiri-Darko added that such a change needed a combination of “people power” and government accountability; saying that one or the other alone would not bring it about. She said that, where she knocks on doors in south west London, air pollution was a major concern and only when climate change began to affect people would they start to demand action from their elected officials.

The panel in London Photograph: Kevin Rawlinson

Raworth cited Donald Trump’s presidential election campaign as an example of what she characterised as an obsession with growth at the expense of other issues, such as the protection of the environment.

Raworth agreed that Trump has an “old-fashioned economic mindset” and his election was unlikely to be helpful to those who sought to fight climate change. But he said, looking at the bigger picture, the election of a US president - possibly only for four years - should not be seen as a catastrophic event, adding that Trump can be influenced because of the extent to which he cares about his esteem.

Bennett agreed that there was cause for optimism, arguing that movements have never brought about major societal changes unopposed.

It was only when the campaigns to abolish slavery were doing really well that the pro-slavery movement formed. They said ‘this will harm my competitiveness, we can’t possibly afford this, it’s going to cost jobs’. Almost identical arguments to those used now by people campaigning against action on climate change.

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20:13



Jonathan Watts

The cup of coffee that millions of us woke up with this morning was

more likely to have come from Brazil than another nation. But this ritual will become rarer and more expensive, according to forecasts that climate change will cut the bean-growing belt by half here and across the world over the next 35 years.

Drought and rising average temperatures are already a growing worry for farmers such as Maria Assunção da Silva, whose family has grown coffee in Minas Gerais since the 19th century.

The business has rarely been tougher than in the past four years. In 2013, the drought was so severe the beans formed as empty husks. Since then, he says, the weather has been destructively unpredictable. It has been dry in the usual rainy season, which results in smaller beans. In the usual dry season, it rains, which makes it difficult to process the harvest.

“What we have been seeing in these past years has been hindering our production,” Silva says.

Others have fared worse. In Espírito Santo recently, the worst drought in 80 years forced farmers to dig up thousands of arid robusta coffee trees and switch to alternative crops. Warehouses in the region were down to a quarter of their capacity. Exports of conilon, a variety of robusta, fell 90%. With prospects poor for this year, many warehouses are [expected to close](#).

Growers say the weather is becoming more erratic and extreme. São Paulo’s coffee producers suffered dire water shortages in 2015, but when the rains finally came, it was often in intense downpours that led to flood damage. While the main temperature trend is of warming, some crops were hit by frost in freakish cold spells last winter - in the middle of the hottest year ever recorded in the world. “What is certain is that the weather is more unstable and unpredictable,” noted agronomy engineer and coffee farmer, Pedro Ronca.

Overall, improved production techniques and well-timed rains for the main arabica crop ensured a good national harvest and a stabilisation of prices. But scientists and environmental groups warn the situation will become more difficult in the years ahead in Brazil and other coffee-producing nations.

Picture of a coffee plant infested with the coffee-eating fungus roya, which is spreading in warming temperatures. Photograph: Ezequiel Becerra/AFP/Getty Images

“Increasing temperatures and extreme weather events will cut the area (in the world) suitable for production by up to 50%, erode coffee quality, and increase coffee prices for consumers,” predicted [a Climate Institute study](#) last year.

Earlier [research](#) by the International Centre for Tropical Agriculture, suggested none of the current coffee producing regions in Brazil would have the ideal conditions (average temperatures of 18-22C, ample rain

and no frost) by 2080. “Once full climate change effects are experienced, Brazil may face challenges to remain a major coffee producing country,” the authors noted.

This grim scenario is far from inevitable. As well as global efforts to reduce emissions and mitigate climate change, Brazilian officials, scientists and farmers are moving to adapt.

Eduardo Assad, of the government’s agriculture [research institute Embrapa](#), believes there is considerable potential to move coffee production to the southernmost state of Rio Grande do Sul. Currently that is not feasible due to frost, but this risk will decline if temperatures rise by 2C.

Even so, this would require huge disruption to Brazil’s agriculture, particularly to coffee farmers who usually require 15 to 20 years for a return on their investment. For now, most would rather stay put and use technology and chemicals to cope with rising climate challenges.

Silva is investing in a coffee drier because he cannot depend on the sun, more anti-fungicide chemicals because the risks from unseasonal rain have increased, and to counter the rising temperatures he is planting new heat-resistant varieties of coffee and insulating the soil with straw.

“We don’t think the weather conditions will improve, so we are trying to adapt to the new climate variation,” he says.

Such measures push up his costs and the global value of beans, but, if the forecasts are correct, it is only the start of the rise in price that we will all pay for our morning cup of coffee

A coffee picker carries sacks of coffee cherries at a plantation in the Nogales farm in Jinotega, Nicaragua.
Photograph: Oswaldo Rivas/Reuters
Updated at 8.27pm GMT

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20:00

HOOR 13: drought from sea to sea

As **Jonathan Watts** reported earlier, the end of the world is looking not just warm but dry, from the mountainous lakes of South America up to the disappearing snowpacks of California. Later on we’ll hear how this increasing aridity is going to affect your meal: – breakfast, lunch, dinner and dessert.

We’re also going to hear about Nasa’s future under Trump and the growing range of wildfires

Fifteen [things you can do](#) to make a difference

Adam Gabbatt on [New York's rooftop solar farms](#)

[George Monbiot](#): 'Commentators seek glimpses of light in Trump's position. There are none'

The [world's biggest solar farm](#) springs up – in China

The ever-popular [climate quiz](#)

And the [climate clock](#), still ticking away

The Guardian

(@guardian)

Sea levels could rise by six to nine metres over time, new study warns <https://t.co/MjFXqJ9J59>

January 19, 2017

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19:56



Adam Gabbatt

Michael Ingui, an architect at [Baxt Ingui Architects](#), specializes in creating passive houses – “super-insulated houses that use a fraction of the energy” of a traditional home.

Passive houses use much less energy than a traditional home due to a by using superior insulation, special triple-glazed windows and an energy recovery ventilator which filters in fresh air and releases stale air. The ventilator is used to heat the house, which means no radiators and no boiler.

It also means significantly less energy costs: Ingui estimates his passive houses save “80-90%” on energy bills.

“The way I would really describe it is: a passive house is just a better

building,” Ingui said. “It can also heat and cool itself passively, without any mechanical elements.”

The walls of a passive house are **much thicker** than a normal home due to the extra insulation, which Ingui described as forming an “envelope” in which any gaps that may exist in a traditional home are completely sealed.

Ingui has designed and fitted out seven in the past four years, and is working on three more. Some of those homes – including the one I looked around in Brooklyn on Thursday – have solar panels on the roof, which means they can effectively be carbon zero.

[Try watching this video on www.youtube.com](#)

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Patagonia Photograph: Jonathan Watts for the Guardian

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2h ago

19:40

What happens in Antarctica does not stay there: the icy waters off the southernmost continent are an engine for life around the world, and

they are warming faster than anywhere else – a threat to the global food supply.

For decades, scientists have been diving underneath the quickly melting ice in a race to learn the consequences of warming on the ecosystem.

[Try watching this video on www.youtube.com](#)

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2h ago

19:25

For six years of increasingly withering heat, Californians have rationed resources, [fought with celebrities](#) and watched as precious reservoirs and snowpacks, so important to the state's economy and daily lives of its residents, disappeared to historic lows. When it rained, it was never enough – though hope has partially returned with massive storms of the last three weeks.

According to [the US Drought Monitor](#), about 42% of the state is out of drought, thanks to a series of heavy rains around the Bay area and blizzards over part of the Sierra Nevada, where snowpack provides critical water for the state in the spring and summer. The heavy rains also replenished the state's largest reservoir, Lake Shasta, back to 82%, and even Los Angeles saw flash flood warnings as storms stretched across the state.

But southern California has not enjoyed as much of a deluge as the north. Santa Barbara's Lake Cachuma holds only about 8% of its capacity. New Melones Lake, in central California, holds only about 60% of its historical average, and some residents in the region need bottled water to drink and cook.

Jay Lund, a professor of environmental engineering at the University of California Davis, warned that the drought will leave scars that may last decades. The state may have to keep paying for expensive water pumping for years, and in the Central Valley some aquifers "might never recover to pre-drought levels", he [wrote](#) in a blog post.

"Drought damage to California's forests could require decades to recover, or, if higher temperatures persist, the ecology of many forests might shift to new normal condition," he added. "Native fish also will likely need years to recover – with impediments from already depleted

numbers and highly disrupted and altered ecosystems.”

Lund said that the state’s leaders need to accept that the drought is not permanent, but that California is “a dry place with permanent water shortages (except in unusual wet years)”.



An American tragedy: why are millions of trees dying across the country?

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Updated at 8.30pm GMT

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2h ago

19:24

Over on Tumblr, we’ve been running a blog collecting young people’s experiences, hopes and fears on climate change. You can submit your own messages or artwork here. We’ll be highlighting some of the posts throughout the day.

aww hell no.

1. climate change is no joke (contrary to the everything-inconvenient-to-my-goals-is-a-conspiracy based opinion of

many “conservatives”), and our responsibility to work to reverse it will result in a better life for all life on this planet.

2. climate change does not noticeably effect my area, but my community of close friends is global, and i hear how they are effected at an alarmingly increasing rate.

3. message to world leaders: don't ever give trump the benefit of the doubt, he has done absolutely nothing to earn it. he has a lot to prove to earn the world's trust, and his history speaks volumes against him. lying, cheating and buying his way out of trouble are daily business with him, and the presidency is nothing more than a business decision to him. another bad gamble from an amoral, out-of-touch sociopath who has no problem sinking the boat as long as his gold-plated helicopter is waiting nearby.

- [@beenposh](#)

5 hours ago

Updated at 7.30pm GMT

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19:14



Jonathan Watts

The end of the world is dry. That is not a prophecy of doom, but an increasingly evident fact as I learned during a recent trip to Patagonia.

I visited in October, revelling in the immensity of the region (which is four times the area of the United Kingdom), zagging back and forth between its Chilean and Argentinian sides, delighting in spectacular mountain and grassland scenery, and taking a dark pleasure in the road signs telling me I was on the “Ruta del Fin del Mundo”, a geographic reference to this southernmost tip of the Americas rather than a reminder of imminent apocalypse.

I also spent a lot of time skimming stones across lakes - a childhood pastime given a fresh boost by the incredible scenery, the glasslike surface of tarns in the Torres del Paine, warm weather and the discovery of a slow-mo feature on my cellphone video camera.

Much as I enjoyed this activity, it also reminded me of the damage being done by rising temperatures and declining rainfall. Lakes formed by glacier melt were full. Many others had dried up completely, destroying fish habitats and drinking sources for jaguars, guanacos and ema. This wasn't restricted to Torres del Paine. Five hundred miles further south, I saw pink flamingos flapping their way across a half empty body of water and, then, another 15 minutes along the road, a fox crossing through the dust of a white alkaline lake bed that had been completely exposed to the wind. Over the course of the weeklong trip, I lost count of the lakes that had evaporated.

Patagonia Photograph: Jonathan Watts for the Guardian

After I returned home, I did a little research on whether this was merely seasonal or a sign of a longer-term climactic shift.

Climate scientists believe the world's extremities, the poles and mountains ranges, are [warming faster than elsewhere](#), which means Patagonia is particularly vulnerable because both its latitude and altitude are high.

Shin Sugiyama, a researcher at the Institute of Low Temperature Science at Hokkaido University, confirmed the region's glaciers were declining faster than those in other mountain ranges. Andrés Rivera, a Senior Researcher of the Glaciology Laboratory at the Centre for Scientific Studies in Valdivia in Chile, noted how the recent dry period in the region has contributed to rising snow-lines and a loss of lake volumes.

Eric Rignot, professor of Earth System Science at the University of California, said the glacier melt and lack of precipitation were likely to have been affected by the ebbing of the Southern Annular Mode (SAM), a belt of Antarctic low pressure that normally brings snow and ice to Patagonia. Research from other scientists say SAM is at its weakest ebb in 1,000 years, due in part to increasing greenhouse gas

levels.

Dried up lake in Patagonia Photograph: Jonathan Watts for the Guardian

The consequences are not sudden. Rather they are of steadily increasing severity. Chilean newspapers have reported the worst drought in Patagonia since records began, after [seven consecutive years](#) of unusually low snowfall, short winters and hot summers. In Argentina, this is blamed for [the deaths of 1.8m sheep](#), or 12% of the national flock.

The earlier stage of this prolonged drought has also left a black mark on the landscape in the form of thousands of charred stumps from the huge forest fire that tore through Torres del Paine In 2011. That was started by careless tourists and spread out of control because trees and brush were unusually dry.

Despite it all, Patagonia is still one of the most beautiful places on earth. I would certainly love to go back, explore remote glaciers, marvel at the other worldly skylscapes and, of course, skim more stones. How many lakes, though, will be left?

Patagonia Photograph: Jonathan Watts for the Guardian

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HOOR 12: who needs Washington?

As **Lauren Gambino** reported earlier, mayors in US cities are making plans to fight climate change themselves if they have to. Later on we'll also hear how the financial rewards – the money that can be made in renewables – also holds out hope for the future even if our political leaders fail us.

We're also going to hear about how drought is impacting California and Latin America.

Fifteen [things you can do](#) to make a difference

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Water world: rising tides close in on Trump, the climate change denier

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Adam Gabbatt

New York City and the wider state are embracing renewable energy as the state's leaders take steps to resist Donald Trump's rollback of green initiatives.

The Atelier Condo, a 47-story, 478-unit residential building in Hell's Kitchen, for instance, installed about 3,000-square-feet of solar

panelling in 2011. Daniel Neiditch, president of the Atelier and of real estate company [River 2 River Realty](#), said that after rebates from the city and state, the investment cost \$70,000. Neiditch said he earned that much back in savings after a year-and-a-half. He estimates currently provide almost 10% of the building's energy.

“There’s no way you can do solar and not save money over time,” Neiditch said. “It’s a no brainer.”

New York City mayor Bill de Blasio [has committed](#) to reducing greenhouse gas emissions in the city by 80% by 2050 and both local and state incentives can [cut the cost of solar panel installation](#) by 50%.

Neiditch said some developers don’t realise how quickly they will make their money back, or what kind of rebates are available in their state.

“There’s so much more that can be done,” Neiditch said. He said developers “need to be educated” on the benefits – possibly by the city or state.

The Atelier will be fitted with another 6,000 sq-ft of solar panels this summer, Neiditch said, which could mean solar accounts for 25% of the buildings electricity, saving \$200,000 a year.

[Try watching this video on www.youtube.com](#)

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Lauren Gambino

This morning the Guardian caught up with a couple of big city mayors to discuss their concerns about the incoming administration’s climate change agenda.

The takeaway: who needs Washington?

Los Angeles mayor Eric Garcetti and Boston mayor Marty Walsh said the real change is happening at the local level and federal action, or inaction, won't change that.

"Don't get in our way," Garcetti said, describing his message to an administration that is hostile to efforts to curb climate change at the federal level.

Trump has threatened to pull out of the international Paris agreement and said he would dismantle Obama's Clean Power Plan, as well as other initiatives taken by the Environmental Protection Agency. Trump has nominated Kansas attorney general Scott Pruitt to head up the EPA, the agency he is currently suing.

"We're prepared, if we withdraw from Paris, to enact Paris at the local level," Garcetti told a handful of journalists at the Hilton Continental Hotel in Washington.

"Worst-case scenario, the federal government can probably take away 20% or 30% of our progress, and I'd rather have 100% than 70% or 80%, but I feel like that 70 to 80% of further progress is inevitable based on the leadership that we've already shown."



A field of dead almond trees in Central Valley, California, where drought has been a persistent environmental issue. Photograph: Lucy Nicholson / Reuters/Reuters

Mark Rice-Oxley , Oliver Milman (earlier) and Alan Yuhas (now)

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Oliver Milman

Much of the international fretting over the ascendancy of Donald Trump to the US presidency is focused on the real estate magnate's pledge to "cancel" the Paris climate deal.

Tearing up a central plank of Barack Obama's climate legacy by removing America from the agreement would cause shockwaves that could badly damage the global climate effort. But will that actually happen?

Currently, every functioning government in the world is signed up the Paris goal of limiting global warming to a 2C increase on pre-industrial times. Chinese president Xi Jinping, [in a veiled jab at Trump this week](#), warned that "we must ensure this endeavor is not derailed." Similar diplomatic pressure is likely to come from other nations once Trump is in the White House.

Quitting the Paris accord would take a three-year notice period. A quicker way would be to exit the UN climate body itself, which would take just a year. Such a move would likely cause other countries to question why they should make the effort to cut emissions if the US, historically the world's largest emitter, can't be bothered.

The latter option appears unlikely, for now at least. Shortly after his election win, Trump said that [he in fact has an "open mind"](#) to the Paris deal. And then Rex Tillerson, Trump's pick for secretary of state, played down the prospect of complete US withdrawal last week:

I think it's important that the United States maintain its seat at the table in the conversation on how to address threats of climate change. They do require a global response.

Perhaps the most likely outcome is ostensible US involvement in the UN climate process but with little effort to provide the climate funding or emissions reduction goals demanded by the Paris deal. Whether the Trump administration will be openly disruptive or sullen during talks remains to be seen.

"It isn't clear whether his 'seat at the table' will be a good dinner guest or the drunk uncle," [said](#) Jake Schmidt, director of the international program at the Natural Resources Defense Council.

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In partnership with the Guardian, Univision Noticias is highlighting the urgency of climate action around the world. Join Univision and Fusion environmental correspondent Nicolás Ibargüen as he discusses on Facebook Live.



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HOOR 11: vulnerable communities hit worst

We've heard from **Jonathan Watts** how experts in Brazil are anxious at the indigenous territories and fears there around a government move to change how their land is demarcated. We'll have more on this theme later.

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“ When will our country stop wasting money on global warming? – Donald Trump 2014

Fact / Bloomberg estimates that the US invested \$58.6bn in green tech in 2016



The Guardian

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Fact checking @realDonaldTrump: how much does the US invest in green tech?
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Alan Yuhas

Shortly we'll have live video from our partners Univision in Miami. Before that, it's worth reflecting that Trump has a home in Florida which he regularly spends time at.

Mar-a-Lago mansion began as a cereal heiress' dream of a presidential retreat on a south Florida beach.

The children of its current occupant, President-elect Donald Trump, may live to see the ocean sweep over the tennis courts, up across the long, and up to the mansion's front door. Whether the next president accepts science or not, climate change is on course to turn his beloved resort into something closer to Atlantis than the winter White House. By 2045, a relatively weak category-two hurricane would bring the ocean up to main building of the resort, a risk consulting firm [found last year](#). Two other Trump properties, in Hollywood and Sunny Isles, could be cut off from roads and even made temporary islands by tidal floods.

Mar-a-Lago Club. Photograph: Alamy Stock Photo

Just over an hour the south, Miami is already at war with the ocean, as tides floods increasingly sweep floods into the streets and homes, swamping condo lobbies and cutting off islands and bridges. The rate of sea-level rise has tripled over the last 10 years, according to a [University of Miami study](#). City leaders have budgeted \$400m to install dozens of water pumps around the city and to raise the height of roads and seawalls, but the state remains divided: real estate developers continue to [build expensive condos](#), and the governor [insists on skepticism](#) toward science. The tides, meanwhile, continue

to seep up through Florida's porous limestone ground, threatening to destroy homes and seeping sewage into drinking water. By some researchers' predictions, [parts of south Florida appear already lost](#), and swaths of the state will be underwater by 2025.



Miami, the great world city, is drowning while the powers that be look away

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Oliver Milman

2016 was the **warmest year, globally, on record** and the **second warmest year on record in the US**, following the long-term warming trend. As Trump assumes the presidency, there are signs that these numbers are starting to translate into tangible consequences for Americans:

There are now Americans displaced due to climate change, from **Louisiana** to **Alaska**. Several Alaskan towns are set to be relocated – last year warmer than normal days **outnumbered** cooler than normal days in the state by a ratio of nine to one.

Of the 10 global cities **deemed by the World Bank** at most risk from sea level rise, five are in the US – New York, Boston, New Orleans, Tampa and Miami.

The north-east of the US is **warming faster** than the global average and the sea level is **rising more quickly too**.

Fernando Sanudo walks along a flooded dock to his boat at the Haulover Marine Center in north Miami, Florida.
Photograph: Joe Raedle/Getty Images

New research, **published in Nature**, shows that crop harvests in the US are likely to shrink by as much as a half due to rising temperatures. States such as California, already stricken by drought, are likely to face huge “**megadroughts**” in the future.

Last year there were **15 climate-related disasters** in the US that cost more than \$1bn in damages. A total of 138 lives were lost. The severity of hurricanes and floods is likely to increase in parts of the US.

There has been a **four-fold increase** in the number of large, lengthy forest fires in the American west over the past 30 years.

While Trump may be unconcerned over the impact of climate change, the period of his presidency is likely to involve further signs that Americans are at risk. In response, Trump has so far promised to gut climate and clean energy spending, withdraw the US from the Paris climate deal and attempt to kickstart the ailing coal industry.

Public realization of scientists’ warnings has been illustrated by the latest polling by Yale University. In November, Yale found that one in

five Americans are “very worried” about climate change – the highest proportion yet recorded.

Worries about global warming at highest level since November 2008

Six in 10 Americans are **worried** about global warming. About one in five are **“very” worried**.

Base: Americans 18+, November 2016 | Graphic: Jan Diehm/The Guardian
Source: "Climate Change in the American Mind," Yale Program on Climate Change Communication, George Mason University Center for Climate Change Communication

Yale polling on Americans' views on climate change risk

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Jonathan Watts

4) Where are the public on this issue? Is there an ideological dividing line as in the US, or is there a broad consensus about the science?

In 2015, 28% of Brazilian municipalities entered into emergency or calamity due to extreme weather – droughts, floods, storms, landslides. This affected millions of people so that are aware things are changing.

We don't face the same debate as the US about whether climate change is related to human activities. Last year, the Paris climate treaty was ratified easily despite our political crisis. Even the most conservative members on the political spectrum, the debate is more about what we do about climate change. Some say Brazil has already made the biggest contribution through deforestation reduction and renewables, which

account for a little more than 70% of electricity generation and 40% of the total energy mix. The question is whether to do more. But unfortunately, climate change is not a priority for this government, as it wasn't for the previous one. It is seen as an environmental issue, not a development issue.

5) What does this mean in concrete terms?

The past two years have seen a 60% rise in deforestation. Considering what is going on now in congress, we could see a new era of deforestation in Brazil. It is very alarming. We could be returning to the bad days of more than 10,000 square km of clearance each year.

Deforestation in the Amazon rainforest. Photograph: De Agostini Picture Library/Getty Images

6) How might climate policy be affected by the 2018 presidential election?

I don't think Brazil can elect someone like Trump who denies climate change, but we could have someone with very conservative ideas who sees the environment as an obstacle for development. They might argue that if US is doing nothing on climate, why should we? But one of the candidates will be former environment minister Marina Silva, who will ensure that sustainable development and climate policy are part of the debate. It's too early though to say who might win. We don't know who will run and what will be the impact of the ongoing corruption investigation (intro bribery at the state oil firm Petrobras). But the result will be important. The next president is the one who will have to deliver results because after 2020 Brazil's commitments become obligations.

7) Given the current trends, are you optimistic or pessimistic about the future?

I'm not too gloomy, but Brazil is a country of lost opportunities. Every year, there are more groups who see forests and the environment as obstacles to development. But there are good signs too. There is room in the private sector for discussing climate change as an opportunity for Brazil to benefit from our natural capital. We need a more efficient agriculture and more renewable energy – biofuels, bio energy, wind, solar and hydro. Why not make the most of these competitive advantages? The economic benefits of climate action are huge. We are trying to make this a priority for the next president. But it won't be easy.

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Jonathan Watts

If the world is to get emissions under control, Brazil will be a key player. Over the past decade, it has played a mostly positive role, both in taking domestic action to reduce the rate of deforestation of the Amazon, and also in constructive diplomacy in international climate talks. But economic recession and political turmoil have led many to fear this might change in the future. For an insight into what might come next, I approached **Carlos Rittl**, associate researcher of the Brazilian Climate Observatory, an umbrella organisation that represents more than 40 environment NGOs. Here's our Q&A:

*1) Yesterday, the Brazilian justice ministry **changed the rules** for demarcating indigenous land. What is your take on this?*

This is really, really bad. It is the most negative change made in environmental and climate policy since the government of (Michel) Temer took power last year. Indigenous territories are critical for Brazil's climate resilience. This new move threatens even already demarcated lands, yet the justice ministry moved ahead without any public debate, any discussion with the people affected. It shows what a myopic view the new government has when it comes to land use.

The Xingu river in the Brazilian Amazon rainforest, home to 60% of the world's largest forest and 20% of the Earth's oxygen supply. The area is populated by over 20 million people and challenged by deforestation, agriculture, mining, dam building and illegal land speculation. Photograph: Mario Tama/Getty Images

2) How else has climate policy changed since the switch of government from the centre-left administration of Dilma Rousseff to the centre-right administration of Michel Temer?

In terms of Brazil's goals, there has been no change. But there has been a shift in attitude that could affect whether those targets are achieved. There are many proposals that are bad for the climate. The administration wants to soften environmental legislation and reduce protected areas. Before Temer came to power, he outlined his approach in a document called Bridge to the Future. It contained no reference to climate or renewables. The only reference to the environment was a promise to weaken the environmental licensing

process.

3) One of the reasons for the political shift has been the rise of the agribusiness and evangelical lobbies in congress. What are their goals when it comes to climate policy?

There is a danger that Brazil's climate policy could shift backwards. Agribusiness presents itself as the solution to current economic crisis. They say they need more investment and more support and changes to land policy. The decision made by the ministry of justice yesterday is connected to that. They also want to prevent agribusinesses from having to do annual environmental licensing renewals. They want approval for mining in indigenous territories and protected areas. They are also pushing for more infrastructure to make their business easier. For example on the Tapajos river, they don't just want more dams, but also waterways so soy can be shipped from central Brazil to Europe. All this will make it more difficult for Brazil to deliver on its 2020 climate goals. They are also trying to remove the environment minister from his post because he is trying to do his job.

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Mark Oliver

Over the next few hours we'll also be hearing from our Latin American correspondent, Jonathan Watts. First up he's been speaking to a key expert in Brazil, a key country.

Later we'll hear about his trip to Patagonia, and how climate change is affecting something a lot of people hold dear: coffee.

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Alan Yuhas

Donald Trump's nominee for secretary of state, **Rex Tillerson**, is the outgoing chief executive of ExxonMobil, the oil giant under investigation for possibly defrauding investors about what it knew and did about climate change.

Shortly after Barack Obama's election in 2009, Tillerson [announced](#) his support for a carbon tax – if only because he considers it preferable to cap and trade policies – but environmental groups have [denounced](#) Tillerson's nomination. Tillerson does not deny that climate change is real, but in a hearing with Congress last week refused to answer a question about whether ExxonMobil had tried to sow doubt about the science.

Tillerson told Senator Tim Kaine, "I'm in no position to speak" for his company's executives, until the frustrated congressman asked, "Do you lack the knowledge to answer my question, or are you refusing to do so?"

"A little of both," Tillerson answered.

Tillerson also rejected the Pentagon's warning that climate change is a national security risk and would only say the US will "keep a seat at the table" in the international effort to curb global warming. Trump has previously promised to quit the Paris climate deal.

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HOURLY TEN: Obama's legacy on climate not perfect either



Mark Oliver

As we've pointed out in the previous post, Obama's legacy is far from perfect.

But it's fair to say there are greater fears around the Trump administration's key cabinet posts relating to climate change. **Alan Yuh** is about to post on the pick for secretary of state, Rex Tillerson. Also ahead we'll have more video from New York's rooftops.

Highlights:

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Fact / 2016 was the world's hottest year yet, according to NASA and two other leading agencies



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Alan Yuhas

Barack Obama has banned drilling in the Arctic, fought to reduce pollution and power plant emissions, and preserved more marine territory than any previous president. Yet researchers at Columbia University say that his legacy is tarnished by [the work of the US Export-Import Bank](#), a federal agency that has handed out nearly \$34bn of taxpayer-funded loans to corporations and foreign governments for fossil-fuel projects.

The team at Columbia collaborated with the Guardian last year on a report that showed how Obama's the obscure agency within his own administration quietly spoiled his record by helping fund a steady outpouring of new overseas fossil fuel emissions – effectively erasing gains expected from his headline clean power plan or fuel efficiency standards.

Since January 2009, the US Export-Import Bank has signed almost \$34bn worth of low-interest loans and guarantees to companies and foreign governments to build, expand and promote fossil fuel projects abroad.

Here's a video we made about Obama's climate change legacy.

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Obama's complicated legacy on climate change

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Alan Yuhas

As **Rick Perry**'s rather polite confirmation hearing rolls on, it's worth recalling the [more combative hearing](#) faced by **Scott Pruitt** yesterday. Pruitt is Trump's pick to head the **Environmental Protection Agency**.

The EPA was founded by a Republican administration with a mission to keep America's water clean, its air free of toxic pollution, and help towns around the country keep their fields, roads and rivers safe. Pruitt has used his post as Oklahoma's attorney general to sue the EPA 14 times in seven years, 13 in alliances with energy, agriculture and other large corporations.

Pruitt, 48, is the first pick for EPA administrator opposed by the Environmental Defense Fund since Richard Nixon founded the federal agency in 1970, and has received more than \$300,000 in campaign donations from executives at poultry and oil corporations.

Other environmental groups have called Pruitt a "puppet" of oil and gas companies, noting that in 2014 he [fought regulations with a letter](#) written by Devon Energy. In another case [unearthed](#) by the New York Times, Pruitt stopped a legal fight between towns and poultry companies whose tons of chicken manure were poisoning water in north-eastern Oklahoma.

Eric Lipton

(@EricLiptonNYT)

Pruitt sues EPA challenge CleanPowerPlan. Who's Pruitt's lawyer? Energy industry corporate attorney-Southern Co etc--who "working for free" [pic.twitter.com/TAlwLn98qu](#)

January 16, 2017

If confirmed, Pruitt will likely try to dismantle Barack Obama's work on climate change, with the Clean Power Plan his most obvious target. The plan is currently on hold in the courts, due to a suit brought by 27 Republican-led states to stop it.

Pruitt has also doubted the evidence of climate change in general, claiming in May that – although 2016 proved to [break yet more records](#) for temperature and sea ice, and that nearly all scientists agree the world is warming dangerously – the “debate is far from settled”.

In his home state of Oklahoma, where Pruitt has fought to keep hydraulic fracking as unregulated as possible, scientists have linked fracking to an extraordinary [increase in earthquakes](#). Oklahomans are now [as likely](#) to feel an earthquake as Californians.

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Amana Fontanella-Khan

One of the themes we are looking at is how the impact of climate change does not affect everyone equally.

On Comment, we've just launched a piece from Elizabeth C Yeampierre, the executive director of Uprose, an organization that fights for environmental justice.

She writes: “When things are bad for everyone, they are particularly bad for people of color. The Trump administration is about to legitimize injustice in all of our communities. People of color have endured the extraction of our land and labor – and its legacy – since the creation of these United States. Now, we are bracing ourselves for worse things to come.”

[Read the full comment piece here](#)

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Oliver Milman

Rick Perry, the former governor of Texas, is currently facing questions from US senators in his confirmation hearing as Donald Trump's secretary of energy.

Perry rather sheepishly told the senators that he regrets calling for the department of energy to be scrapped. Famously, Perry ran for president in 2012 only to call for the abolition of three government departments in a televised debate. The problem was [he couldn't remember the name of the third agency](#) – energy – leading him to flounder briefly and then mutter “oops”.

The Senate committee holds confirmation hearing for Rick Perry, Trump's nominee to head the energy department. Photograph: Aaron P. Bernstein/Getty Images

Maria Cantwell, a Democratic senator on the energy committee, couldn't resist: “I suspect now, having a chance to learn about the importance of this department, you have a very different opinion.”

Perry conceded he may have been a little hasty. “After being briefed on so many of the vital functions of the Department of Energy, I regret recommending its elimination,” he told the committee.

The Department of Energy maintains America's nuclear arsenal, cleans up nuclear waste and undertakes research in a number of areas, including climate change.

The Trump transition team raised alarm by sending out a questionnaire that asked for names of scientists who have worked on climate research. Perry said he didn't approve of the request and promised the committee that he wouldn't target climate scientists or eviscerate their work.

Perry did confirm, however, he supports Trump's “America first” energy strategy (which means lots of drilling for oil and gas) and it doesn't sound like he will be bending the president's ear over the

urgency of global warming. He told the committee:

I believe the climate is changing. I believe some of it is naturally occurring, but some of it is also caused by manmade activity. The question is how do we address it in a thoughtful way that doesn't compromise economic growth, the affordability of energy, or American jobs.

This sort of equivocation has become familiar during these confirmation hearings. Both **Rex Tillerson**, Trump's pick for secretary of state, and **Scott Pruitt**, his choice for the Environmental Protection Agency, have said they accept the climate is changing but have voiced doubts over the extent of human culpability for this.

Scientists, on the other hand, are [pretty clear on this point](#) – the world is warming due to human activity such as burning fossil fuels.

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HOOR NINE: ominous signs for climate in Trump administration



Mark Oliver

We've picked up the climate blog in the US, and have heard from outgoing EPA boss Gina McCarthy who says staff there are nervous about the incoming administration's attitude to science and climate change. We've also published the first of our three videos from solar panel clad buildings in New York City.

Coming up later we also have a live video from our partners Univision who are [blogging live in Spanish today](#) on climate change. At around 1pm ET (6pm GMT) we'll host a live video report from them in Miami on the climate change threat. Miami is just one of the places on the US coast already being impacted by rising sea levels.

Highlights of our blog so far include:

15 [things you can do](#) to make a difference

[George Monbiot](#): ‘Commentators seek glimpses of light in Trump’s position. There are none’

The [world’s biggest solar farm](#) springs up – in China

The ever-popular [climate quiz](#)

And the [climate clock](#), still ticking away



The Guardian

(@guardian)

Fact checking [@realDonaldTrump](#): how much energy does the US import?
#GlobalWarning <https://t.co/3n8F5fS2EEpic.twitter.com/x1pjbC3ff1>

January 19, 2017

Updated at 6.01pm GMT

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Adam Gabbatt

Brooklyn Navy Yard, a huge industrial park located across the water from Manhattan in New York City, installed a 3,152 solar panel field on top of one of its buildings in September.

The yard, which is home to 300 businesses with 7,000 employees, expects to generate 1.1m kilowatt hours of energy each year – which it says is the equivalent of reducing carbon dioxide emissions by 1.4m pounds and saving 76,000 gallons of gasoline each year.

The panels cover an area bigger than a football field on the top of a warehouse close to the East river, overlooking downtown Manhattan.

“Sustainability has long been a core corporate value of ours,” said Clare Newman, chief of staff and executive vice-president of the Brooklyn Navy Yard corporation.

“And our tenants and our businesses really care about and embody the same values.”

The project was paid for by Con Ed solutions, a subsidiary of the larger Con Ed energy company. Con Ed solutions secured \$625,863.83 in incentives from the New York State Energy Research and Development Authority, which promotes energy efficiency and the use of renewable energy sources.

[Try watching this video on www.youtube.com](#)

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Mark Oliver

We're looking at all of the issues around climate change – including the solutions. And both New York City – and the wider state – are among the trailblazers in the US when it comes to solar power. In New York City there are thousands of buildings which have been fitted with

solar panels.

During the US hours of our climate change blog, we'll have three videos for you from **Adam Gabbatt**, who we sent to the top of skyscrapers and other buildings in the city to find out how they make that work.

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Oliver Milman

One of the big areas of concern around the incoming Trump administration is the Environmental Protection Agency (EPA).

We've published a story earlier Thursday on an [interview](#) with the agency's outgoing administrator, **Gina McCarthy**.

She told me that there is "**nervousness**" among EPA staff that Trump's incoming administration will sideline science and reverse action on climate change.

McCarthy told the Guardian that the [Trump administration](#) would face resistance from multiple fronts if it ran counter to a widespread shift to renewable energy, as well as scientific opinion, by rejecting climate science and attempting to bolster the fossil fuel industry.

Trump has promised to reduce the EPA to "tidbits" and has nominated the Oklahoma attorney general, Scott Pruitt, to run the agency. Pruitt has sued the EPA 14 times over its pollution regulations, has questioned established climate science and has been criticized by environment groups for his ties to oil and gas interests.

"People at the EPA will be respectful of the new administration but they will continue to do their jobs," said McCarthy, who was appointed by Barack Obama in 2013 to head the regulator. "I would not be telling the truth if I said there was no sense of nervousness. There is a sense of nervousness that the new administration will take decisions not in line with the science.

Read more of the interview with McCarthy [here](#).

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Oliver Milman

Hello and welcome to the American portion of our climate blog, on the eve of Donald Trump's inauguration. **Oliver Milman** in New York and **Alan Yuh** in San Francisco will see you through.

The new president will forever be reminded of his [tweet](#) that claimed that global warming “was created by and for the Chinese in order to make US manufacturing non-competitive”. But that conspiracy theory was expounded four years ago now and Trump's attitude to climate change, like much else, has wobbled in the wind.

Where once climate science was apparently just an excuse for a “very, very expensive form of tax”, Trump [conceded](#) in November there may in fact be “some connectivity” between human activity and warming. On the campaign trail Trump promised to “cancel” the Paris climate deal but now Rex Tillerson, his choice for secretary of state, insists that the US will still have a “seat at the table” in climate talks.

[Climate change](#) may be the defining challenge of our time, but the response of the world's superpower remains clouded in doubt just a day before its new president takes power. Trump has been consistent, however, in his steadfast support for fossil fuels, even donning a miner's helmet during a rally in West Virginia to promise – in the face of economic reality – that coal mining jobs will return.

Environmental groups fear the worst – emissions reduction plans trashed, climate funding scrapped, scientists harassed or muzzled and a vacuum of international leadership that may encourage other countries to ease off their own efforts.

Trump's cabinet picks will be key and the signs are ominous. Incredibly, Tillerson, former chief executive of ExxonMobil, the oil giant that actively suppressed its own knowledge of climate change for

decades, may be the one most in line with mainstream science. Trump's nominations for the Environmental Protection Agency and the department of interior, to name just two, have raised doubts over whether humans really are influencing the climate and have been showered in donations from polluters.

We will look at each of these cabinet picks, as well as outline some of the key climate issues facing the Trump presidency. The next four years could well see havoc from severe storms, rising seas, scorching heatwaves and the spread of mosquito-borne diseases. Pertinently for Trump, these calamities could just as likely occur in the US as some far-flung country. Even his own resort at Mar-a-Lago in Florida [could be at risk](#). A response beyond blaming the Chinese will be required.

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HOOR EIGHT: top climate experts give their messages to Trump



Mark Rice-Oxley

So that's about it from this part of the world. We are off for a lie down in a dark room. Stay tuned though for much, much more from the Americas, hosted by Oliver Milman and Alan Yuhas.

For anyone just tuning in, highlights of this blog so far today include:

[15 things you can do](#) to make a difference

[George Monbiot](#) – 'Commentators seek glimpses of light in Trump's position. There are none'

The [world's biggest solar farm](#) springs up – in China

The ever-popular [climate quiz](#)

And the [climate clock](#), still ticking away

I leave you with this:

[#GlobalWarning](#): these are the top 5 emitters of carbon dioxide <https://t.co/3n8F5fS2EE>
<pic.twitter.com/oi4VQv6VYe>

— The Guardian (@guardian) [January 19, 2017](#)

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Mark Rice-Oxley

A quick interruption with some breaking news: Scotland has just unveiled some of the world's most ambitious targets for cutting carbon emissions, aiming at a reduction of 66% within 15 years.

A windfarm in Caithness, Scotland. Photograph: Murdo Macleod for the Guardian

It's not quite Norway (which is aiming to be carbon neutral by 2030), but it's a laudable aim, reports our Scotland editor Severin Carrell, who has all the detail [here](#).

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Juliette Jowit

Hoesung Lee: 'Climate change is a global problem, so individuals should encourage their governments to take action'

Hoesung Lee, chair of the Intergovernmental Panel on Climate Change

(IPCC), is up next, talking to Juliette.

What is your current assessment of how the world is dealing with climate change?

We are continuing to emit greenhouse gases and if unabated this will cause further warming and changes to the climate system. This increases the likelihood of severe, pervasive and irreversible impacts for people and ecosystems. Substantial and sustained reduction in emissions are needed to limit climate change.”

What is the best action concerned citizens can take?

Individuals can do many things, depending on their local and personal circumstances. One example is improving energy efficiency. Ultimately [though] tackling climate change is a global problem, so individuals should encourage their governments to take action.

Hoesung Lee, president of the Intergovernmental Panel on Climate Change. Photograph: Etienne Laurent/EPA

What is your message to President Donald Trump?

I'd like to congratulate Mr Trump on his forthcoming inauguration as President of the United States. We look forward to continuing to work with the new administration, and with American scientists and institutions, on improving our understanding of climate change and how to tackle its impacts and risks, as we have done for nearly 30 years, since the inception of the IPCC.”

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Damian Carrington

Mark Campanale: Fossil fuel investors ‘will be left holding the baby whilst the world has moved on’

Mark Campanale, founder of the [Carbon Tracker Initiative](#) thinktank and who conceived the idea that many fossil fuel reserves will be

unburnable if the world beats climate change, talks to Damian now:

What is your current assessment of how the world is dealing with climate change?

There is no doubt now that we're in the middle of a major technological revolution in the transportation and power sectors. Electrification of the transport fleet and the rise of cheap solar isn't going to be reversed, actually it will accelerate.

The real question right now is whether technological leaps and cost reductions in renewables can accelerate adoption rates fast enough. The scale of the challenge is enormous – not helped by new investments in fossil fuels exceeding tens of trillions of dollars over the next few decades.

For that reason, we may not be seeing the reductions in fossil fuel power generation capacity that we need. Instead of investors looking at fossil fuel companies as 'ex growth' stocks, they are too many that take a 'business as usual' growth approach to their investment. Time will tell, but our expectation is that investors [anticipating 'business as usual' growth from fossil fuel stocks] will be left holding the baby whilst the world has moved on. The real risk is that the precious years we've got to make the difference we need to the future will have been tied up trying to defend the past.

What is your message to President Donald Trump?

If you're interested in quality, high paying and skilled jobs for the American middle classes, then renewable energy has to absolutely be the place to look. It's a sector with more employees now than in the US coal industry and with a long way to grow.

What is the best action concerned citizens can take?

Switch to a clean energy supplier like Good Energy, or maybe a community utility and project developer like [Mongoose Energy](#).

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Damian Carrington

May Boeve: ‘The climate movement is more important than ever’

May Boeve, head of climate campaign group 350.org, is next up:

What is your current assessment of how the world is dealing with climate change?

I think we've entered into a new chapter in the climate fight. Renewables have become cheap and widespread enough to represent a real threat to the fossil fuel industry, so they're beginning to fight back. If we can make it beyond the political barriers coming up worldwide and elect governments who take climate change seriously, we have all the technology we need to make rapid progress and succeed in keeping global warming as close to 1.5C as possible. But it's going to be a real fight. The work of the climate movement is more important than ever.

May Boeve, head of climate campaign group 350.org. Photograph: Graham Turner for the Guardian

What is the best action concerned citizens can take?

Organize. We can't solve climate change alone. Get together with people and change your community, your country, and the world.

What is your message to President Donald Trump?

Quit. But if you have to stick around, realise that the clean energy economy is the greatest, biggest job creator in history.

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Juliette Jowit

Ed Davey: ‘To fight Isis and make America great again, invest in solar’

Former climate secretary and Liberal Democrat MP now talks to Juliette Jowit

What is your current assessment of how the world is dealing with

climate change?

The Paris agreement surpassed my expectations about what's possible - although it's still not enough, given where we are. We have had president Obama's leadership, Xi Jinping's (China's) leadership, and president Modi's (India's) leadership. Then we had technological break-throughs, particularly solar."

What is your message to President Donald Trump?

To fight Isis and make America great again, invest in solar. Where does Isis' power come from? They are funded by oil and gas, particularly oil."

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Ian Sample

It would be wrong to think that Donald Trump's views on climate change reflect those of the American people. While the incoming president is dismissive of the overwhelming scientific consensus that global warming is real, serious and driven by human activity, the US population is not. A [survey in November](#) for the Yale program on Climate Change Communication found that 70% of Americans think climate change is real, and just over half, 55%, believe humans are mostly to blame.

The figures are encouraging. But they make clear that the US public, like those in other countries, lags far behind the scientific opinion. The fact is that many people still don't accept that climate change is driven by human activities, and that it is serious enough to warrant action.

In the Guardian's [Science Weekly podcast](#) today, we explore why climate change risks can be hard for us to take on board. [Debika Shome](#) at the TCC Group co-authored a report for Columbia University on the psychology of climate change communication. She explains how the perception that global warming is a problem for people who live far away and far in the future, combines with scientific jargon and the

inherent uncertainty around climate predictions to make climate change messages an exceptionally tough sell. But here, another field of science can help. Understand human psychology better, and the messages can be made to hit home, she says.

Supporters cheer Donald Trump at a rally in Charleston, West Virginia. 70% of Americans think climate change is real. Photograph: Mark Lyons/Getty Images

During the US presidential re-election campaign in 2012, [Matthew McGregor](#), now at Precision Strategies in New York, ran Barack Obama's digital rapid response team. Matthew is not an expert on climate change, but he does know how to mobilise people to take action. We asked him how he would make people care more about climate change. Facts, he says, are not enough.

Also lending advice is [Tima Bansal](#), professor of sustainability at Ivey Business School in Ontario. The climate change problem cannot be solved without help - and sometimes radical changes in behaviour - from businesses, large and small. But with little incentive to change their ways, what can we as consumers do to force corporations to act in the world's best interests? As Bansal explains, it could be easier than you think.

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Damian Carrington

Ben van Beurden: 'We don't have to sacrifice economic growth'

Ben van Beurden, CEO of Royal Dutch Shell plc, now:

It's good news for all of us that [the Paris climate agreement] came into force. The scenarios that we and others have done clearly show that a future of net-zero emissions is technically feasible near the end of the century. And not only can the world achieve it technically, but it also makes economic sense in a societal way. In

other words, we don't have to sacrifice economic growth. That's the good part.

The remaining challenge is: can it be done commercially? Economically is about the way society can bear it, commercially is about how to make sure the main actors – consumers and companies – can, and will, do the right thing. And if society, through government, doesn't ensure it makes commercial sense to move to a net-zero emissions energy system, nobody will make the next step.

The good thing is that the Paris agreement raised the bar for everyone. Everybody feels the obligation to act. So in that sense I'm actually very optimistic.

The nature of the challenge of climate change is that it will require unprecedented levels of co-operation between government, industry and society. What often tends to happen in our industry is that you have either isolated advocacy, or people have a very adversarial approach: I'm for, you're against. In the end this doesn't resolve anything. It just creates noise for policymakers. We have to move beyond that and start real collective planning for how we are going to achieve the kind of energy transition the world needs.

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Craig Bennett: This is 'decade zero'

Craig Bennett, head of Friends of the Earth England, Wales and Northern Ireland, talks to Damian ...

What is your current assessment of how the world is dealing with climate change?

The climate impacts of global temperature rises of just 1C have already triggered melting ice-caps, unleashed killer storms and droughts, bleached the world's coral reefs, choked our cities with pollution and displaced people from their homes. The case for urgent action is now universally accepted by governments, scientists, business and ordinary citizens around the world.

Whilst trillions of dollars are being invested in the renewable energy sector and building a low carbon economy, this is still too little and too slow. This is 'decade zero': The decisions we make now on meeting our energy needs, producing our food and protecting our forests will determine if we can keep temperature rises well below 2C and prevent catastrophic climate change. We're sitting in the last chance saloon but governments still seem unable to break their addiction to dirty energy – unless people power can make them.

What is your message to President Donald Trump?

Renewable energy and the low carbon economy is the world's greatest job creator. Be smart, and lead from the front. Clean energy, owned by American citizens, acting in the interests of American citizens will not only make 'America Great Again', it will save lives and protect your nation too.

What is the best action concerned citizens can take?

Be part of the movement to 'keep fossil fuels in the ground'. It's as simple as that. Divest your money from banks that fund it, switch energy suppliers to green energy, support communities saying no to fracking, demand our politicians act now before it's too late. And join an environmental organisation like Friends of the Earth.

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Damian Carrington

Professor Dame Julia King: 'Trump needs to build an economy for 2050, not 1950'

Prof Dame Julia King, an eminent engineer and one of the UK government's official advisers at the Committee on Climate Change is next up, talking to Damian Carrington.

What is your current assessment of how the world is dealing with climate change?

To have a good chance of keeping global temperature rise to below 2C the world will need to reverse the rise in greenhouse gas emissions and reduce carbon dioxide emissions to zero within the next 50 years or so. This involves switching to clean forms of electricity, transport, cooling and heating, and finding ways to avoid – or mop up – emissions from industry, agriculture, shipping and air travel. We are not currently on track to achieve this, but global momentum is building quickly. What is encouraging is that many companies, cities and citizens are now taking a leading role, alongside pledges and action from governments around the world.

What is your message to President Donald Trump?

If President Trump wants to deliver greater job security for Americans, he should focus on clean and sustainable industries where the US has a competitive advantage. Those are the sectors that are set to prosper. He needs to build an economy for 2050, not one for 1950!

What is the best action concerned citizens can take?

*The Committee on Climate Change recently looked at how to **reduce UK emissions over the next 15 years**. We found that some of the best things people can do to reduce their household-level carbon footprint are:*

Save money, by making your home energy efficient, and making choices on food and travel that lower costs and emissions.

Take advantage of new technologies – if you drive, switch to a fully electric vehicle and look at a smart home energy system.

Make your voice heard, by, for example, continuing to talk to your local politician and others to urge them to act, find out what companies your pension fund invests in and write to the trustees to encourage them to switch to 'low carbon' investments.

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Damian Carrington

Michael Liebrich: 'Wind and solar now the cheapest new power sources in much of the world'

Now it's Michael Liebrich, founder of analyst firm Bloomberg New Energy Finance and who has advised the UN and World Economic Forum on energy, speaking to Damian Carrington.

What is your current assessment of how the world is dealing with climate change?

The past decade gives us enormous cause for optimism. Relentless growth in global CO₂ emissions has been brought to a halt much earlier than anyone thought possible. Wind and solar power have become the cheapest new power sources in much of the world; natural gas is outcompeting carbon-intensive coal; LEDs and

other energy efficiency solutions are being installed at scale; and electric vehicles are starting to fly out of showrooms.

But it's not enough to stabilise emissions: to stay within a 2C carbon budget we have to see emissions cut dramatically and quickly, which remains a staggering challenge. The Paris agreement set out ambitious long-term aspirations, but its near-term commitments don't add up to much. In particular, if Asian countries build all the coal-fired power stations currently in their plans, then kiss goodbye to the 2C warming target.

What is your message to President Donald Trump?

If I had one minute with president elect Trump my message would be that the best way to 'Make America Great Again' is by owning the clean energy, transportation and infrastructure technologies of the future. Not only will this create countless well-paid, fulfilling jobs for Americans, but will also lock in the US's geopolitical leadership for another generation.

What is the best action concerned citizens can take?

Focus on a few big things. If you are renovating, insist on lots of insulation, good windows, a good boiler and efficient appliances. You can cut your fuel bills by 75% – I know because I've done it. If you live in a city, get rid of your car: join a car club, walk or cycle more, use cabs and public transport. Again, I know because I haven't owned a car in London for 22 years. And don't fly short-haul, use trains – you'll get there quicker too.

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Damian Carrington

John Schellhuber: 'We are now at a watershed in history'

Prof John Schellhuber, at the Potsdam Institute for Climate Impact Research in Germany, and who has advised Angela Merkel, the Pope and the EU, now speaks to Damian Carrington.

We are now at a watershed in history I think, because the traditional industrialised countries – US, UK, parts of Europe, Australia – are now more or less giving up being pioneers for climate action and it is emerging economies [like China and

India] that are doing the bold steps. The world is upside down really. The old developed world has more or less lost faith in saving the planet and it is the new economies who seem to take the lead. This is the hope we have.

Politicians can't do it on their own. The political process is so slow and dysfunctional almost everywhere. There are two factors that can accelerate our transition to sustainability. One is clearly technological progress, which is often much faster than anybody expects. The other is civil society, you have to put pressure on your politicians. You have to raise the moral bar much higher. You have ask them 'do we want to save this planet for our descendents or not?'

Prof John Schellnhuber Photograph: Popow/Getty Images

On the actions concerned individuals can take, Schellnhuber said three things stick out:

Try to avoid using airplanes. Whenever you do a carbon balance sheet, you see flying is just the worst thing you can do regarding your carbon footprint and often it is more convenient to take a train these days. Second is to reduce your meat consumption, if you eat any, and that is also good for your health.

The third one is follow the money: the fossil fuel divestment movement. Tell your bank manager you would like your money be invested into renewables instead of coal, oil and gas industry. At least become a pain in the neck. What companies fear like hell is loss of reputation, as that can break even the big companies' necks.

Updated at 2.41pm GMT

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Damian Carrington

Nicholas Stern: 'Destruction of the environment would reverse economic growth'

Leading climate change economist Lord Nicholas Stern, at the London School of Economics, has also spoken to Damian Carrington for this blog.

Stern said global action on climate change has made substantial progress, with the Paris agreement and the UN's sustainable development goals creating a global agenda for the first time since the

end of the second world war.

It was agreed by everybody and applies to everybody. That is extremely important and quite extraordinary when you think how difficult it is to put together a global agenda with 196 countries.

Lord Nicolas Stern, leading climate change economist Photograph: Jonathan Nicholson/Getty Images

But he said it was openly acknowledged that the Paris deal leaves a big gap between the current plans and what is needed to avoid 2C of global warming - the danger limit agreed by the world's nations.

The next very big question is how do we ramp up those ambitions. China, the biggest emitter, is ahead of the game. It said it would peak [its carbon emissions] by 2030, but my guess is it will peak not very long after 2020. That is the key example. I have been working in China for 30 years and the change over the last six to seven is quite remarkable.

India is starting to get much more committed too. So if you look at the two countries with the biggest populations, you do see changes. But the US and Europe will matter greatly to this. It is very important Europe raises its game.

Stern said Donald Trump needs to back the green economy to take advantage of the growing global demand for clean energy, which is being driven by the worldwide commitment to tackling global warming.

If you want to make America great again, building modern, clean and smart infrastructure makes tremendous commercial and national sense, In the longer term, the low carbon growth story is the only growth story on offer. There is no long-term, high-carbon growth story, because destruction of the environment would reverse growth.

Stern said concerned individuals should put pressure on governments and businesses:

Demand explicitly and directly strong action from the politicians, particularly in cities where we know action can be extremely rapid. Do your shopping at firms that are responsible. It does need political, business and civil society push. The reason is that the urgency and scale is not sufficiently understood. We will double the world economy in the next 20 years or so. If we build this new world economy anything like the old one, then we are not going to get down to the [emissions] we have to be. There has to be radical change.

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Juliette Jowit

Professor James Hansen
Director of the Earth Institute, Columbia University, and
‘father of climate change awareness’ spoke to the Guardian
after winning the [BBVA Foundation Frontiers of Knowledge](#)
Award.

What is your current assessment of how the world is dealing with climate change?

“The global temperature has increased since 1970 at about 0.18C per decade, and it’s going to continue at approximately that rate, because the climate change is driven by environmental imbalance: there’s more energy going in from the sun than out into space, because of the climate change gases.

“The climate impacts are extremely detrimental, and the worst one is sea level rise, because of the ice sheets going unstable, [and] the economic and humanitarian cost of that is devastating.”

Atmospheric physicist and Columbia University Earth Institute adjunct professor James Hansen testifies before the Senate Foreign Relations Committee during a hearing about the proposed Keystone XL pipeline project in the Dirksen Senate Office Building on Capitol Hill March 13, 2014 in Washington, DC. Photograph: Chip Somodevilla/Getty Images

What is the best action concerned citizens can take?

“The single most important thing [individuals] can do is to join Citizens Climate lobby: they [and] other organisations advocate a simple rising carbon fee. People that join are asked to write letters to the editor, op eds [comments in newspapers], write to representatives, legislators, and they do it in a respectful way.

What is your message to President Donald Trump?

“If [Trump] wants to achieve the things that he claimed he would: improving the situation of the common man, the best way he could do this would be a programme of a rising carbon fee with the money distributed to the public.”

Updated at 4.12pm GMT

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Eric Hilaire

Photographs of the [melting Greenland ice sheet by Timo Lieber](#) are a beautiful but chilling reminder of the impact of climate change.

All photographs use three colours. Each represents a symbolic value: pristine white is the ice sheet, blue is water and black is dirt. These colours form the chromatic point of view and are the clue to reading them. Beyond this simplicity, the pictures are scientific documents that reveal and link the two global phenomena: global warming and atmospheric pollution.

“The images are deliberately abstract.” says Timo Lieber in an interview by Tim Walker. “I didn’t want them to be documentary photographs. You have to get close to find the small, hidden details that help you to understand what you’re seeing. They’re beautiful, but what you’re looking at is climate change at its worst. My favourite is the one that looks like an eye. It’s a half-circle of concentric blues at the top of the image – it’s almost as if global warming is looking right back at you.”

Looking climate change in the eye: ‘It’s almost as if global warming is looking right back at you.’ Photograph: Timo Lieber/Bonhams

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Damian Carrington

UN climate chief: ‘There is a lot all of us can do to bend the curve towards the world we want and need’

Patricia Espinosa, executive secretary of the UN Framework Convention on Climate Change - the UN’s climate chief – today gives her views on climate change to our head of environment Damian

Carrington.

What is your current assessment of how the world is dealing with climate change?

There are very positive actions and signals from all areas of society post-Paris [climate agreement] including from governments and cities to business, investors and citizens. But the reality is also that greenhouse gas emissions in the atmosphere continue to rise and thus national and international ambition needs to rise even more. The world needs to peak global emissions urgently and trigger a steady but significant de-carbonisation of the global economy so that year on year and decade on decade the total achievement is in line with the science. We are on the way towards a better, climate-secure world, but it will be a long journey and only a sense of urgency will get us to the 'well below 2C target'.

What is your message to President Donald Trump?

I look forward to working with your new administration to make the world a better place for the people of the US and for peoples everywhere in this very special world.

Patricia Espinosa, UN climate chief Photograph: Becker & Bredel/Getty Images

What is the best action concerned citizens can take?

There is a lot all of us can do to bend the curve towards the world we want and need. Get informed and get involved. Be a conscious-consumer for example: there is wealth of information on the environmental footprint of goods and services. Think about how you travel, and try to choose a lower emissions form of transport while offsetting those emissions you cannot avoid right now.

2017 is the UN's International Year of Sustainable Tourism for Development – take time to do so research on the sustainability of your holiday and leisure activities.

If you are lucky enough to have a pension or investments, find out how your money is being used – is it supporting environmentally-sustainable companies or not.

Get more involved in your community and city – actively argue and support public transport policies; renewable energy; energy efficient initiatives and ones to back forests; wetlands and other nature-based 'infrastructure'.

Updated at 2.11pm GMT

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13:57

HOURLY SEVEN: questions and answers, with Damian Carrington

Thanks Damian. I hope that hour answered lots of your questions. If not, keep them coming. New York will take over from us within the

next hour, and our US environment correspondent Oliver Milman will be at the helm.

Here's another fact for you:

[#GlobalWarning](#): major floods in Europe are on the rise <https://t.co/3n8F5fS2EE>
pic.twitter.com/D12xH2co25

— The Guardian (@guardian) [January 19, 2017](#)

Coming up: what are the best books and films about climate change?
What animals are most at risk from climate change right now?

Plus: a word with the experts, unfashionable as they may be in some quarters these days. We've spoken to a plethora of leading figures climate change debate and found a surprising amount of consensus about what needs to happen next to our climate.

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13:56



Damian Carrington

Last question I'm afraid, but it's a good one, from [@takvera](#).

John Englart EAM

([@takvera](#))

[@dpcarrington](#) what's probability of multi-metre sealevelrise this century with Greenland, West Antartica & now Totten glacier unstable?

January 19, 2017

Low. Although you are right that those ice caps are very vulnerable to global warming, it takes a long time to melt such big chunks of ice. But in coming centuries, the risk is very real. The last time the Earth had CO₂ levels as high as this, sea level was many metres above what it is today. That would wipe out many of the world's biggest cities.

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13:49



Damian Carrington

[@OisinMoriarty](#) asks about electric car takeup.

Oisin Moriarty

([@OisinMoriarty](#))

[@dpcarrington](#) [@guardian](#) how far from 50 percent of all cars being electric are we

January 19, 2017

A long way is the truth, but the takeup is accelerating very fast. There were about [2m electric cars on the world's roads at the end of 2016](#). That's just 1% of the market in Europe and China. But as cheaper models with longer ranges arrive and cities crack down on air pollution, more and more will take to the roads.

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13:44



Damian Carrington

On Twitter, [@FourTwoThreeOne](#) asks:

FourTwoThreeOne

([@FourTwoThreeOne](#))

[@dpcarrington](#) Hi Damian, how bad (& how soon) will climate change Australia? A country which already has wild weather and long droughts.

January 19, 2017

Right here, right now is the answer. Scorching heatwaves are [already five times more likely](#) thanks to global warming and it's not going to get better until carbon emissions start to fall. You can [read more here](#).

Updated at 1.45pm GMT

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13:40



Damian Carrington

[MercuryBen](#) asks a political question.

Why is it that climate change scepticism is so popular with those on the right-wing?

I'd suggest two reasons. First is that tackling global warming requires communal action, which for those libertarians far to the right looks just like communism. Communism is evil, therefore climate change can't exist.

The second reason is that the fossil fuel lobby gives far more money to rightwing politicians, as they are seen to be more "pro-business" than those on the left.

But as the Tory politician John Gummer, now [Lord Deben](#), argues [today](#): "Conservatives cannot properly be climate deniers. At the heart of their political stance is a desire to hand on something better to the future than they have received from the past."

8h ago

13:34



Damian Carrington

[ID5865653](#) asks an important question about whether aviation can be made greener.

Does anyone know what, if any, progress is being made on making flights more carbon neutral? I know there was a successful round-the-world solar flight in 2016, but that doesn't seem likely to bear fruit commercially any time soon. Are the fuel requirements just too large for electric planes etc to be practical?

Flying does have a heavy carbon footprint – about 1 tonne for every economy passenger from London to New York and back. But I don't think electric planes – like [Solar Impulse](#) – will ever carry many passengers. Batteries are just too heavy and solar panels need too much area.

More likely is the adoption of a sustainable biofuel for jets, perhaps from algae, jatropha or even tobacco. But progress has been slow. For freight at least, [air ships](#) are a possible future alternative. For now, using a good [carbon offset scheme](#) is the only solution.

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13:28



Damian Carrington

The livestock industry causes about 15% of all greenhouse gas emissions, and [CordTrousers](#) asks:

Any suggestions other than vegetarianism?

[Meat does have a heavy carbon \(and methane\) footprint](#), but not all meat is equal. Beef has by far the biggest footprint, so cutting out that alone makes a big difference. Reducing meat consumption, rather than going vegetarian, is also an option backed by many, dubbed [climatarian](#) or [reducatarian](#).

As it happens, lots of people in rich nations eat more meat than is healthy, so cutting back would [help lengthen many lives](#). Also, lots of new companies are starting to produce [vegetable-based substitutes](#) for meat and dairy products, aiming to make them as tasty, healthy and affordable as the originals.

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13:23



Damian Carrington

[PeppermintSeal](#) wants to know what the impact of ocean acidification might be. Much of the world's CO₂ emissions end up being absorbed by the oceans, which become more acidic as a result.

Regarding the increased acidity in the oceans, what follows from this? More coastal erosion and threat to sea life I'm guessing, but are there other things happening? Does acidity affect salt levels?

Ocean acidification is real but research is still ongoing. This is from a [UK research programme](#): "Already ocean pH has decreased by about 30% and if we continue emitting CO₂ at the same rate by 2100 ocean acidity will increase by about 150%, a rate that has not been experienced for at least 400,000 years. Such a monumental alteration in basic ocean chemistry is likely to have wide implications for ocean life, especially for those organisms that require calcium carbonate to build shells or skeletons."

I think acidification is unlikely to affect salinity or coastal erosion. But rising sea levels and fiercer storms will affect coastlines.

Updated at 1.39pm GMT

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13:20



Damian Carrington

Lots of commenters, for example [greensocialist147](#), are arguing that overpopulation is the fundamental problem.

The world's population is set to rise to 9 or 10 billion by 2050, which definitely makes beating climate change tougher. But the critical thing is the size of their carbon footprints.

If they all cause the same emissions as today's Americans or Australians, we are doomed to catastrophic climate change. But if, as is difficult but possible, emissions from energy, transport and buildings are reduced to very low levels, then a large global population can live sustainably on the planet. In terms of curbing population growth, poverty reduction, education for girls and availability of contraception for those who want it are vital.

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13:17



Damian Carrington

Crucial question next from [yourcomment](#).

Is it compulsory for every article on global warming to feature a photo of a polar bear? Why?

Well, no. But they are beautiful animals and the Arctic is warming far faster than the rest of the planet. But the [research here](#) suggests, among many things, that images of real people are effective ways to

communicate the significance of climate change, too.

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Damian Carrington

Reader [rokealy](#) wants to know how climate change will affect the UK and Europe.

This is such an important matter and delighted that you are covering this in such an excellent way. Really educational yet at the same time quite unsettling. With the rise in temperatures, and various reports coming to conclusions that Europe will get warmer or colder, can you give a clearer picture of what we (Ireland, UK, Europe) can expect to see in our climate in the near future?

The short answer is: more extremes. With more heat in the atmosphere, there's more energy to drive more extreme events, such as storms. In the UK, the main consequences are more [severe flooding and more deadly heatwaves](#), which the government's official advisers, the Committee on Climate Change, say are high risks already. Summers are likely to get drier and hotter overall and winters warmer and wetter. But there will also be extreme cold snaps, probably [driven by the fast-melting ice in the Arctic](#).

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13:09



Damian Carrington

Next up is a question from Clare Rudkin, on whether global warming can be blamed for specific events.

I would like to know the percent of increase in likelihood of events that seem to be linked to climate change.

Weather has a lot of natural variability, but climate changes increases the chances of many types of extreme weather – loading the dice, if you like. Scientists are getting better and faster at calculating how much the probability of heatwaves etc occurring are increased by global warming.

In some cases, it's a lot. Warm sea temperatures linked to severe bleaching of the Great Barrier Reef were made **at least 175 times more likely**, the extreme Russian heatwave of 2010 was made **three times more likely**, major floods in Paris in 2016 were made almost **twice as likely**.

Updated at 1.10pm GMT

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13:03



Damian Carrington

Hi! I'm Damian Carrington, head of environment at the Guardian, and I'll be tackling your climate questions for the next 45 minutes or so. Please post anything you'd like to ask in the comments below or tweet me @dpcarrington.

Here's the first one, from Sandie Elsom.

Congratulations on deciding to focus on this most important of all issues. I'd like to see clear explanations of what the science is saying and just how serious the outcomes will be. I have difficulty convincing family members that climate change is a clear and present danger.

These [webpages by Nasa](#) are very good: clear and striking. You could also take a look at the assessment of the world's scientists produced by the Intergovernmental Panel on Climate Change. It concludes that [global warming is set to inflict "severe, widespread, and irreversible impacts"](#) on people and the natural world unless carbon emissions are cut sharply and rapidly.

The assessment involved thousands of scientists – probably the biggest scientific review in human history – and was approved by 196 nations, making it as definitive as it gets.

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12:56

HOOR SIX: saviour tech



Mark Rice-Oxley

Journalism often tends to focus on the problems, and as such can often give a glum view of the world. But during this hour we've heard from:

The [Egyptian hydroponics farmer](#) trying to beat the drought

the [team at the Thames Barrier](#) in London, the kind of tech that might be needed elsewhere in the world

the British Antarctic Survey, [keeping tabs on climate change](#) at the bottom of the earth

some of the innovators offering [21st-century ideas](#) to fix a 21st-century problem

Soon we're going to hand over to Damian Carrington, our head of environment, to answer your questions. But before we go, can I make a

personal plea for you to consider joining us as a member? Journalism is a costly business, as I'm sure you can appreciate from the work that has gone into this product. But we do it because we believe things like this can make a difference, can help build the movement to roll back climate change. If everyone reading this blog gave just a small amount, we would be on a far firmer footing to keep producing work like this.

Support us with [a monthly payment](#) or [a one-off contribution](#). Many thanks everyone. Here's the hourly Twitter card:

[#GlobalWarning](#): Animal populations have plummeted <https://t.co/3n8F5g9E3e>
pic.twitter.com/rnyFlntcZU

— The Guardian (@guardian) [January 19, 2017](#)

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12:55



Damian Carrington

When it comes to green tech, the electricity sector has seen the biggest focus so far, with the cost of solar, wind, LED lighting and batteries plummeting in the last decade. The cost of conventional nuclear power has not, but so-called “[small modular reactors](#)” (SMR) are now [attracting a lot of attention](#): smaller, cheaper and mass produced is the promise.

An [SMR design was recently submitted to regulators](#) in the US, but Tom Delay, chief executive of the Carbon Trust, is not holding his breath. “I do laugh when people talk about SMRs being five years around the corner. The licensing conditions for nuclear – quite correctly – imply a very slow development process because you can’t mess around with it.”

The great hope for nuclear for decades has been nuclear fusion, which

carries the prospect of cleaner and limitless energy. However, even those building the biggest fusion experiment in the world – [ITER in France](#) – acknowledge that commercial nuclear fusion will not come before 2050, by which time global emissions will already have to be near zero.

Much faster to deliver will be smart grids, which [apply data and communication software](#) to make far more efficient use of existing electricity, creating in effect “virtual power stations”. These, along with [storage of intermittent renewable energy](#), are the most important technologies, say experts, allowing countries to move to 100% renewable energy on the grid. [Big batteries are already replacing power plants](#) in California.

A breakthrough in battery chemistry to deliver cheaper, more powerful devices is being sought around the world but they are not the only way to store energy – a plant in the UK is already using [air compressed into a liquid](#).

New renewable technologies are also being investigated. Researchers are seeking breakthroughs in solar energy, a truly global energy source, aiming to make panels that capture even more of the sun by, for example, using [perovskite crystals](#) instead of silicon.

In recent experiments, Los Alamos National Laboratory scientists have produced these perovskite crystals that exhibit solar conversion efficiencies comparable to those of silicon, the current gold standard. Photograph: Courtesy of Los Alamos National Laboratory

9h ago

12:43



Damian Carrington

I've been looking at all kinds of technology that promises to help us battle climate change in the decades to come.

Solar and winder energy capacity has risen sharply in the past decade

Renewable Electricity Installed Capacity, million kW

SolarWind

0
100
200
300
400



2005
2007
2009
2011
2013

Guardian graphic | Source: US Energy Information Administration

Of course, renewables have been a quiet success story over the past 20 years – but this is only half the picture. From solar air ships to lab-grown meat, algae jet fuel to nuclear fusion, technology innovations around the world hold the hope of slashing carbon emissions and giving a big boost to the battle against global warming.

Mission Innovation, a collaboration involving 50 of the world's biggest nations, is set to invest \$30bn a year by 2020 on clean technology, and the UK's special representative for climate change, Sir David King, played a leading role in its creation. One of his favourites is a huge new airship being developed by a British company, **VariaLift**, to provide low-carbon freight transport.

The plan is to cover the airships with photovoltaics, then rise them to 50,000 feet where there is very little air resistance. Solar energy can then power the electrical engines and the airship could reach speeds of 340km/h.

Varialift airships are being developed to provide low-carbon freight transport. Photograph: Courtesy of VariaLift Airships

Also attracting attention is a German idea to store energy in regions without mountains, where pumped-water storage cannot be used. **Heindl Energy's** solution is to raise a giant column of rock using the pumped water, which is then allowed to fall again when the energy is needed.

The allure of new technology is strong, not only to speed up cuts in emissions, but also because of the colossal market it represents, offering good jobs and economic growth. The **International Energy Agency** estimates that \$44tn will be invested in energy by 2040, with

an ever bigger slice going to clean technologies.

Updated at 12.44pm GMT

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12:31



Mark Rice-Oxley

Of course, science is a vital part of our understanding of climate change, and down at the bottom of the earth, the British Antarctic Survey (BAS) are conducting a range of experiments and observations to keep tabs on any changes in conditions.

The BAS collaborated with us to get exclusive video back from the Antarctic, and my colleague Irene Baqué put together this short package to show what's going on.

[Try watching this video on www.youtube.com](#)

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12:24



Adam Vaughan

While flood defences are often criticised and the government is regularly accused of failing to account sufficiently for how much climate change is making it worse, the UK's Thames barrier has been a real, unsung success story. Built in eight years, its six gates have never failed to protect London.

In the early hours of last Saturday morning, Steve East made a judgment call to protect Londoners from the Thames. Faced with tidal and weather forecasts and other data, the engineering manager of the Thames Barrier decided to raise it for the second occasion in 2017 and the 178th time since it was finished in 1982.

The result was a 3.3 metre differential – the height of the water level on the downstream side, which leads out to the North Sea, above the upstream side of central and west London, which the huge structure protects.

[Try watching this video on www.youtube.com](http://www.youtube.com)

“It’s an art, not a science because we are making decisions on forecasts,” he tells me, as we overlook the barrier where the rotating gates are raised in times of need. East started working as an administrator at the barrier 31 years ago. Over that time, he’s not seen a linear line showing the barrier being closed more frequently, but a more jagged line with spikes in individual years.

For example, in one recent year the barrier was closed on 50 occasions in just a three month period. Before that it had gone about two years without a closure. “It’s an easy decision to close it. The hard decision is not to close it,” he says. While closure protects Londoners and property from flooding, it also stops river traffic, wildlife such as seals, and puts a “strain on the asset”, as East puts it, wearing the barrier out.

The barrier should last until about 2070. [Climate change](#) means a 20-90cm sea level rise in the Thames by 2100, according to the Met Office and Defra, and East is clear: “There’s an acknowledgment that sea level rise will require a new barrier.”

Planning is just beginning on what location and size that barrier might take, but the project is anticipated to cost £10bn. Some of that money will go on raising and strengthening the tidal walls downstream of the barrier, and making space for water downstream to overflow into during tidal surges, such as car parks and playgrounds.

East thinks that when the barrier starts having 50 closures a year

regularly – at the moment the average is four annually – that’s when a new barrier will be needed. But for now – even with the two closures in less than a month this year – “we’re a long way from that”.

Updated at 12.27pm GMT

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12:14

Ruth Michaelson

Across the Middle East and north Africa, global warming means record temperatures, which in the summer can make life unbearable from Tehran to Tripoli.

The knock-on impact on farming in the region has been severe – indeed some people have even blamed the Arab spring partly on the way climate change has depleted agriculture.

But some enterprising farmers are finding ways to beat the drought, like this Egyptian extolling the virtues of hydroponic farming – that uses more than 95% less water by not planting in soil.

[Try watching this video on www.youtube.com](#)

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12:04



Emily Wilson

A final three tips on positive individual action here from [Chris Goodall](#):

- For a decade, investors ignored the movement that advocated the

divestment of holdings in fossil fuel companies. Large fuel companies and electricity generation businesses were able to raise the many billions of new finance they needed. Now, by contrast, money managers are increasingly wary of backing the investment plans of oil companies and switching to renewable projects. And universities and activist investors around the world are selling their holdings in fossil fuels, making it more difficult for these companies to raise new money. Vocal support for those [backing out of oil, gas and coal](#) helps keep up the pressure.

- Politicians tend to do what their electorates want. The last major UK government survey showed that 82% of people supported the use of solar power, with only 4% opposed. A similar survey in the US showed an even larger percentage in favour. The levels of support for onshore wind aren't much lower, either in the US or the UK. We need to actively communicate these high levels of approval to our representatives and point out that fossil fuel use is far less politically popular.

Climate campaign group 10:10 cover Parliament Square outside the UK parliament with more than 1,000 whirling pin wheels highlighting public support for onshore wind power in December 2016. Photograph: Andrew Aitchison/In Pictures/Getty Images

- Buy gas and electricity from retailers who sell renewable power. This helps grow their businesses and improves their ability to provide cost-competitive fuels to us. Renewable natural gas is just coming on to the market in reasonable quantities in many countries and fossil-free electricity is widely available. Think about switching to a supplier that is working to provide 100% [clean energy](#).

Chris's 15 things you can do to help stop manmade climate change is published in full [here](#).

Updated at 12.06pm GMT

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12:00

HOOR FIVE: reasons to be (cautiously) cheerful



Mark Rice-Oxley

Have we really been going five hours? We're just getting warmed up. No pun intended. If you're waking up in America, stay tuned: our New York office will be taking over this running article in a couple of hours, with the focus switching to the inauguration tomorrow.

In the past hour, we've really only had time to skim the surface of some of the good things going on in this time zone:

the Afghan hero [trying to reforest](#) an entire province

the Israelis [who turn salt water into drinkable stuff](#) – and export the technology around the world

the Swedes [building a carbon sink](#) in Stockholm

Please do post your questions for our head of environment, Damian Carrington, to answer, or you can email him on damian.carrington@theguardian.com. He'll be with us at 1pm GMT.

And here's another fact for you:

[#GlobalWarning](#): Mass extinction is destroying the natural world <https://t.co/3n8F5g9E3e>
pic.twitter.com/NMDmA6LJ6Q

– The Guardian (@guardian) [January 19, 2017](#)

Right then. We've not nearly finished with good news so we're going to carry on past the hour with more inspiring people and technology, starting with the Egyptian farmer beating the drought with smart water-saving kit.

Updated at 12.02pm GMT

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9h ago

11:55

David Crouch

This month sees the launch in Stockholm of the world's first urban carbon sink. The project will trap carbon from garden waste and store it in the ground, thereby compensating for the emissions of around 700 cars.

The idea is based on turning wood and other organic waste into "biochar", produced like charcoal by heating it in the absence of oxygen. The first firings will make use of thousands of discarded Christmas trees.

Discarded Christmas trees. In stockholm they can now be processed in the world's first carbon sink.
Photograph: Victoria Jones/PA

In the shadow of a large conventional power station in the southern suburbs, the new carbon sink will produce 300 tonnes of biochar a year, which will then be used to fertilise the city's parks and green spaces. In turn, heat generated during the process will be used to heat local apartments.

Simon Rea, of of Bloomberg Philanthropies, which is sponsoring the project, told me:

This is the world's first urban carbon sink. We want other cities to be inspired by Stockholm and start their own biochar production.

Combatting "climate apathy" in this way is seen as an important aspect of the project, which wants to involve Stockholmers and make them feel that they themselves have a role to play in influencing the climate.

The project organisers say that three more cities and a US federal state have already shown an interest: Melbourne in Australia, Mysore in India, Parma in Italy, and the state of California.

Mattias Gustafsson of Stockholm Water, told me:

It is just the beginning. This natural carbon sink will not save the world but we must begin to pay off our carbon debts.

Updated at 12.08pm GMT

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10h ago

11:48



Peter Beaumont

Israel has long experience of dealing with some of the pressing demands of climate change.

Inside the high pressure hall at the world's largest water desalination plant on the Israeli coast near Rishon Lezion, a forest of pressure vessels is humming with the sound of sea water being made drinkable at the equivalent of 65 atmospheres.

The plant, completed just three years ago, is at the cutting edge of a desalination technology being exported around the world from China to India, to California and Australia, promising new sources of water in a warming world.

The success of the Sorek plant and others like it in Israel – built by Israel Desalination Engineering [IDE] – is a testament to recent leaps made in desalination technology.

One hundred years ago the British in Mandatory Palestine predicted that water would be an issue for a growing population, a challenge that has obsessed Israeli politicians over the decades.

Today, Israel is a net exporter of water and its desalination plants provide almost 65% of the country's potable and industrial water.

The Sorek water desalination plant – the world's largest – in Rishon Letzion, Israel. Photograph: Dan Balilty/AP

Advances in reverse osmosis water purification technology have made it possible to build plants large and small, and increasingly environmentally friendly, allowing the production of drinkable water wherever there is access to the sea.

The process is fast and relatively cheap.

In the space of the Guardian's visit to the plant, sea water extracted from the Mediterranean was cleaned once by being passed through large filtration tanks, cleaned a second time, then filtered in the high pressure hall before having traces of boron removed in a cascade and then treated to soften the water and make it drinkable.

Udi Tirosh, of IDE, told me:

There has long been an interest here in water recovery. Water shortages are a world issue. California has suffered six years of successive droughts. We are working on a new plant north of San Diego as well as a facility in Tienjiang south of Beijing in China which also has water shortage issues – a thermal extraction plant in this case. In India we are working on a plant for an industrial concern.

Updated at 11.50am GMT

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10h ago

11:38



Emily Wilson

Terry Macalister, formerly the Guardian's energy editor and now on the Cambridge Climate Lecture Series steering committee, has just sent this blog post in to us:

Terry writes:

Global carbon emissions could be cut by one third within 12 months if affluent westerners changed their way of life, according at least to one leading climate change scientist.

Kevin Anderson, professor of energy and climate change at the UK's Manchester University, says a major reduction in personal air travel is a key starting point.

More than half of the Co2 pollution which causes global warming comes from the 10% best-off people on the planet, he argues.

“Let's be clear about this. If the top 10 high emitters – people like you and me and others – if we reduce our carbon footprint just to the level of the average European it would be a one-third cut in global emissions.

“I genuinely think we could achieve it in one year but we would have to think that climate change is a very serious issue and that has big political implications.”

Shoppers on Regents Street in London. Wealthy westerners must change their lifestyles, says Anderson.
Photograph: Victoria Jones/PA

Anderson, who already avoids flying where he can, made his comments in the run up to a talk he will give on 9 March at Cambridge University.

This is part of a new town and gown initiative, the [Cambridge Climate Lecture Series](#), designed to rekindle more debate on global warming.

Anderson is convinced that wealthy westerners must act decisively and radically to change their lifestyles.

“Those of us who are high emitters ... need to rapidly curtail how often we fly. We should not be flying on any occasion business class or first

class because that has far higher emissions. We need to find alternatives to flying.

“But in addition, we need to make sure that we are not living in larger houses and have many houses, and drive larger cars.

“Our high incomes allow us to have status in society and typically have larger carbon footprints. It is a real challenge for us in that position because we have to significantly change in the short-term our lives and find other ways of seeing value for hard work.”

Anderson plans to use his talk to explain what kind of personal, societal and corporate changes need to be made in Britain to meet the UK government’s commitment under the Paris climate change agreement.

Updated at 11.52am GMT

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11:30

Sune Engel Rasmussen

Afghanistan is one of the world’s most vulnerable countries to climate change – but some people are trying to make a difference.

An estimated 80% of Afghanistan’s natural resources have been destroyed over four decades of conflict, Ahmad Seyer, director of the Rural Green Environmental Organisation (RGEO) and one of the few Afghan charities working to mitigate the effects of climate change, has told me.

Reforestation in the Afghan Badakhshan province to help absorb greenhouse gases and provide protection against flash floods. Photograph: Ahmad Seyer

Seyer, a civil engineer by training, worked to protect the environment since the mid-1990s, during the Taliban regime, when he worked with international agencies. But it was not until three years ago that he really became aware of the problems associated with climate change. Since then, climate change has been an integral part of the environment awareness training his organisation provides to mosques and schools.

*In most villages where I go, they actually understand. **Climate change** is visible to them now. There is not enough snow, and not enough rain.*

RGEO works across 90 villages in Badakhshan in Afghanistan’s remote

northeast to protect biodiversity. Only three percent of Afghanistan's surface is covered by forests. Loggers and people in need of wood to burn during winter threaten what is left.

RGEO has reforested 200,000 trees to help absorb greenhouse gases and provide protection for communities during flash floods, which hit Badakhshan almost every year. Last year, following a 6.6 magnitude earthquake, [a flood destroyed over 800 homes](#) in the province.

However, while a more sustainable environment would help boost livelihoods in the long term, for many families, economic concerns, compounded by war and unemployment, are more immediate.

Farmers have had to sell livestock to survive. Many migrate to Iran to work as day labourers, and some choose to join the insurgency, Seyer said.

"Compared to previous years, people have become so poor," he said.

In 2015, [RGEO received the UN's Equator Prize](#), which has helped boost funding for his organisation. It now runs on about \$100,000 over the next couple of years, about half of which is provided by the United Nations Development Program.

Faced with the task of convincing fellow Afghans, living in dire conditions, to care about the environment, Seyer said he was dismayed to see the incoming American president scoff at climate change.

"This is not a joke. Please fight against climate change," he said, addressing Donald Trump. "NGOs can't do this alone. Hundreds of people can't do it; thousands of people can't do it. Everybody needs to come together."

10h ago

11:22



Emily Wilson

Back to more positive actions that individuals can take. For obvious reasons most of these tips (again from Chris Goodall) focus on what wealthier citizens (which includes most westerners) can do. Here are three:

- The CO2 impact of goods and services is often strikingly different from what you'd expect. Mike Berners-Lee's book [How Bad Are Bananas?](#) takes an entertaining and well-informed look at what really matters. Bananas, for example, are fine because they are shipped by sea. But [organic asparagus](#) flown in from Peru is much more of a problem.

- Invest in your own sources of renewable energy. Putting solar panels on the roof still usually makes financial sense, even after most countries have ceased to subsidise installation. Or buy shares in new cooperatively owned wind, solar or hydroelectric plants that are looking for finance. The financial returns won't be huge – perhaps 5% a year in the UK, for example – but the income is far better than leaving your money in a bank.

Solar panels being installed on the roof of a house in South East London. Photograph: Andrew Butterson/Alamy

- Buy from companies that support the switch to a low-carbon future. An increasing number of businesses are committed to 100% renewable energy. [Unilever](#), the global consumer goods business, says its operations will be better than carbon-neutral by 2030. Those of us concerned about climate change should buy from businesses acting most aggressively to reduce their climate impact.

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11:13



Emily Wilson

Over the next hour we're going to try to focus on the positive. We'll look more at what we can all do as individuals, and at inspirational work both locally and internationally to combat manmade climate change.

It's really easy to feel despairing and overwhelmed about climate change. Personally I found this piece by Chris Goodall today to be both inspiring and cheering. He writes about how he used to believe that only massive government subsidies would make clean energy a success, which basically meant it would be a failure. Now he admits he was "completely wrong" about that, and argues that the end of the

fossil-fuel era is already in sight:

*In fact, optimism about successfully tackling climate change has never been more justified, because 2016 was the year in which it finally became obvious that the world had the technology to solve the problem. Even as the political environment has darkened, the reasons have strengthened for believing that a complete transition to **low-carbon energy** is practical and affordable within one generation.*

The full article is [here](#).

Updated at 11.13am GMT

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11:09

HOURLY: Europe, from peak to coast. Plus the climate change symphony



Mark Rice-Oxley

So Europe might not be on the frontline of climate change but it's already feeling the deprivations of flooding, drought, and rising sea levels.

Over the past hour we've reported on:

- In Italy, questions as to whether [climate change might transform wine making](#).
- Insurers reporting a [sharp increase](#) in weather-related payouts.
- And we are still [trying to draw](#) climate change.

Finally, another fact for you:

[#GlobalWarning](#): Humans pose the biggest threat to polar bears <https://t.co/3n8F5g9E3e>
pic.twitter.com/FRjfEkOCXZ

— The Guardian (@guardian) [January 19, 2017](#)

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ask for your help. The Guardian's journalism takes a lot of time, money and hard work to produce. But we do it because we believe that independent reporting and plurality of voices matter. If everyone who reads our reporting helps to pay for it, our future would be much more secure. Support us with [a monthly payment](#) or [a one-off contribution](#). - Guardian HQ

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10:57



Mark Rice-Oxley

Of course, different parts of Europe face different challenges.

In Spain, Sam Jones reports that some forecasters believe that [southern Spain will be reduced to desert by 2100](#) if the current rate of greenhouse gas emissions continue unchecked.

Researchers looked at the consequences for vegetation in the Mediterranean basin under a variety of possible temperature rises. In the worst case scenario – which would see global temperatures rising by nearly 5C by the end of the century – deserts would expand northwards across southern Spain and Sicily, and deciduous forests would be replaced by Mediterranean vegetation. Roughly a third of Spain would find itself as arid by then as the [Tabernas desert](#) in Almería is today.

As one ecologist has pointed out, a rise of nearly 5C would be [“like bringing Casablanca to Madrid”](#).

Roughly a third of Spain could be as arid as the Tabernas desert in Almería by the end of the century, say researchers. Photograph: Alamy

This warming has implications for the Alps too. The Guardian's Stephanie Kirchgaessner, says that in the Italian resort of Obereggen, sometimes it has not been cold enough to give the town much time to crank up its snow production.

Resident Thomas Ondertoller told her:

Last year we had one week to make the snow. We use a lot of water, and a lot of technical expertise, to make as much snow as possible, because usually after that there is a warm period.

For the passionate skier, the product is perfect. For the romantic skier, something is missing," he says.

Further north, it is the sea, not the snow that is the problem, Jennifer Rankin reports from Belgium.

Authorities in Flanders, guardians of Belgium's 73km strip of coastline, are spending €8m (£6.9m) to investigate whether they can build an island to keep the rising tide at bay. The newest bit of Belgium would be off the coast of Knokke, the genteel resort best known for its picturesque dunes and posh golf course. Under an early plan, the island would be 40 hectares big, but could be made 10 times larger over time.

Across the border, the Dutch have built the world's biggest storm barrier, near Rotterdam. The Maeslant barrier – two enormous steel gates almost as long as the Eiffel tower – is designed to protect the port city and the rest of southern Holland from a once in a 10,000-year storm.

Peter Persoon, an engineer-turned-tour guide, said:

What we tell the people here in the Netherlands is, if the country is flooded the damage will be at least €700bn.

If you instead spend every year one billion euros, you spread the bill over 700 years. That is, I think, the Dutch way."

Updated at 11.02am GMT

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10:55

Stephanie Kirchgaessner

For years, the biggest problem facing vineyard owners in Tuscany's Chianti region has been the [prevalence of scavaging wild boars](#) in the area, a relatively modern phenomenon in the ancient winemaking region.

But the threat of climate change could soon eclipse the havoc that has been wrought by the swine, according to a local climatologist who said changes in temperature are already having an effect on wine

production in Italy.

Giampiero Maracchi, a professor at the University of Florence and expert in sustainability and agriculture, says rising temperatures have already increased the amount of sugar in wines from the north to the south of Italy, though the change might not yet be noticeable.

“For the time being, there has been no real negative effect on quality. For the future, it is yet to be seen,” he said.

Rising temperatures could have a negative effect on the quality of Italy’s wines. Photograph: Christian Delbert/Alamy Stock Photo

There has been another change related to climate that is sure to have a bigger impact: harvests in Chianti are now happening earlier than in the past. The harvest period used to be around 1 October, he said, but now it is happening between 1-15 September, often because of heatwaves. These are occurring with greater frequency and intensity in the summer months, leading to a faster maturation of the grapes.

It means that in the future, in a decade to three decades from now, grapes in the Chianti region may require irrigation, which is not required now.

“If we look to the models, with the projected increases in temperature, there will be a water shortage and probably in the future – 10 or 20 or 30 years – we should require some irrigation for grapes. It means we should have some reservoirs of water,” he said.

Maracchi said the issue is not necessarily at the top of farmers’ minds, though it should be.

“You know, up until the time comes that they can see some effect from the economic point of view, they are not concerned,” he said. “They should be, in my opinion, because climate change is a general problem and we [will] have a lot of trouble.”

It is not just an Italian phenomenon. In its [2016 global wine output estimate](#), the International Organisation of Vine and Wine last year said it expected global wine production to drop by about 5% due to “climatic events”, causing steep drops in production in Chile and Argentina.

While the group did not point a finger of blame at climate change specifically, it suggested that global warming, coupled with natural climate variability, were causing a profound change in the wine business, and had made 2016 one of the worst wine production periods in the past two decades.

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10:41



Jennifer Rankin

The other issue that looms for Europe is that of climate refugees. War and persecution have forced more people to flee their homes than at any time since records began. But droughts, flooding and storms are also having a catastrophic effect.

Almost 60 million people around the world fled their homes in 2014 due to conflict, [according to the UN agency for refugees](#). In the same year, 19.3 million were forced to move because of natural disasters, [a study by the Norwegian Refugee Council](#) concluded.

Only a small number came to Europe. The majority fleeing conflict in the Middle East and Africa go to neighbouring countries or regions; most victims of extreme weather live in Asia.

The drought refugee camp at Barve nagar in Mumbai, during the worst drought in Maharashtra in decades.
Photograph: Subhash Sharma/Alamy

Nevertheless, European Union policymakers, struggling to cope with large numbers of recently-arrived migrants, are aware that climate refugees could be on their doorstep.

This week the EU commissioner for humanitarian aid, Christos Stylianides, told the Guardian:

Europe is also surrounded by regions that are vulnerable to the effects of climate change and we can definitely not afford to ignore the links between climate change and migration.

He is careful about drawing links between climate change and migration, saying that climate change can multiply instability, conflict and state fragility, prompting people to leave their homes.

Statistics are difficult to pin down, partly because of the role environmental degradation plays in fuelling conflict. Scientists have

said a devastating drought in Syria between 2006-2010 – and the weak response of Bashar al-Assad’s government – was a [contributory factor to the ongoing conflict](#).

British economist, Nicholas Stern, has estimated that up to 200 million people could be displaced by climate change by 2050. But not all will end up in safer places. People leaving desertified villages can move to towns lying on a flood-plain. Some will not afford to be able to move: natural disasters that impoverish communities make it harder for people to start again somewhere else.

This means climate change is also likely to put more pressure on the EU’s humanitarian aid budget, worth €1.27bn (£1.1bn) in 2014. Stylianides says the EU is spending more on reducing the risk of disasters. But only 13% of EU aid is spent on prevention, while the demand for urgent humanitarian help is growing.

Updated at 10.42am GMT

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10:29



Emily Wilson

The Guardian has published a leader article on Trump and climate change today.

It makes the point that while Trump may be able to wreak a lot of damage on the climate front, it’s not all going to be up to him:

There’s no doubt the world will lose out if America decides to relinquish global leadership on battling climate change. But Mr Trump’s fossil fuel plans are likely to flounder without higher hydrocarbon prices. No one will frack for gas unless profits can be made. Coal mines won’t reopen while shale gas is cheap. Instead, self-interest will undergird the fight against global warming. [China will decarbonise to ensure its citizens don’t choke to death in its cities](#). The costs of clean energy are tumbling too, keeping nations on the path towards decarbonisation. The price of electric vehicles is dropping; offshore wind power has become dramatically

cheaper. For the first time, the costs of wind and solar power have dropped to match those of fossil fuels. Last year was the first in which renewable energy surpassed coal as the world's biggest source of power-generating capacity. Countries such as India have ambitious plans for renewable energy.

You can read the full leader [here](#).

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10:21



Mark Rice-Oxley

More on Europe in a minute, including Belgian flood defences, poor snow at ski resorts (boo hoo) and the grave threat to Chianti ...

But first something completely different. We're going over to Facebook live to watch people draw climate change. You may laugh. This might not work. You may get a better view of what's going on by going [here](#).



Posted by **The Guardian**
78,622 Views



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Updated at 10.34am GMT

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10:20



Arthur Neslen

If global warming has a canary in the mine, perhaps it's the insurance industry. After all, they are the people who have to pay out when extreme weather events hit.

And in Europe, they've been paying out more and more in recent years, as an extraordinary succession of flooding and storms sweep the continent.

Munich Re, the world's largest reinsurance company, have shown me data indicating that the number of devastating floods requiring big payouts has more than doubled since 1980. The firm's latest data shows there were 30 flood events requiring insurance payouts in Europe last year – up from just 12 in 1980.

Cars that have been swept into a pile by torrential rains on a street in Genoa, Italy in 2011. Photograph: Antonio Calanni/AP

Globally, 2016 saw 384 flood disasters, compared with 58 in 1980, although the greater proportional increase probably reflects poorer flood protections and lower building standards in the developing world.

Munich Re's Ernst Rauch told me:

In Europe, we've seen a steep increase in flood events related to severe convective [thunder] storms. The frequency of flash floods has increased much more than river floods since 1980.

Here's the [full article](#).

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10:06



Mark Rice-Oxley

Now then, something a bit different. Yesterday, the world's leading temperature authorities announced that yes, [2016 was the hottest year on record](#), and that the world was on average 1.1C warmer than in pre-industrial times.

The idea of rising temperatures can be hard to visualise. So why not sit back and listen to it instead:



150 years of global warming in a minute-long symphony

11h ago

10:04

hour three: the UK, flooding – and the carbon countdown clock



Mark Rice-Oxley

So the UK is by no means immune to climate change, and in the next hour, we'll discover that that goes for Europe too.

Do keep your comments coming – there's a really vibrant debate going on below the line. If you would prefer a Spanish version, have a look at what our partners Univision are doing [here](#). And if you fancy contributing something more artistic or visual, then Tumblr is [the place to go](#).

Finally, our fact of the hour, on the hour, every hour. Well, five minutes late – sorry about that.

[#GlobalWarning](#): Since the 18th century, the acidity of the ocean has increased by around 30% <https://t.co/3n8F5fS2EE> pic.twitter.com/GTlu00fXsW

— The Guardian (@guardian) [January 19, 2017](#)

Updated at 10.05am GMT

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11h ago

09:57



Severin Carrell

The UK's attempts to cut its CO₂ emissions are in real danger of being undermined unless ministers tackle the continuing erosion of peatlands, which store several billion tonnes of carbon, Scottish environment campaigners have warned.

Recent studies estimate that damaged peatlands – most frequently found in upland areas, already release about 16m tonnes of CO₂

equivalent each year through erosion, burning for grouse shooting and overgrazing. Scientists expect that to worsen dramatically as rising temperatures dry out peatland in rain-starved areas, and extreme weather events increase, without concerted effort to protect and conserve them. That in turn will increase flash flooding of lowland towns and villages.

Scientists estimate that Scottish peatlands, which cover about a quarter of Scotland's landmass, lock up about 1.7 gigatonnes of CO₂.

Peatlands in Forsinard, Caithness, Scotland. Photograph: Peter Cairns/NPL/Alamy

Jonny Hughes, chief executive of the Scottish Wildlife Trust and chair of the UK's International Union for Conservation of Nature (IUCN) peatlands project said:

Peatlands are just not in good enough health to withstand the effects of climate change in the coming decades.

Watching peatland landscapes washed away due to climate change sounds like a dystopian nightmare. Yet climate modelling predicts it to be a very real threat, leading to the loss of millions of tonnes of carbon and the destruction of an entire living ecosystem."

Updated at 10.22am GMT

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12h ago

09:52



Emily Wilson

Here are three more tips on individual action you can take to help, courtesy of [Chris Goodall](#):

LEDs (light-emitting diodes) have become cheap and effective. If you have any energy-guzzling halogen lights in your house – many people have them in kitchens and bathrooms – it makes good financial and carbon sense to replace as many as possible with their LED equivalents. They should last at least 10 years, meaning you avoid the hassle of buying new halogen bulbs every few months. Not only will your CO₂ footprint fall, but because LEDs are so

efficient, you will also help reduce the need for national grids to turn on the most expensive and polluting power stations at peak demand times on winter evenings.

Frequent use of a tumble dryer will add to your energy bill to an extent that may surprise you. But when buying a new appliance, don't assume you will benefit financially from buying the one with the lowest level of energy consumption. There's often a surprising premium to really efficient fridges or washing machines.

Smart energy monitors can help to lower energy use and cut bills. Photograph: David J. Green/Alamy Stock Photo

Consume less. Simply buying less stuff is a good route to lower emissions. A new woollen man's suit may have a carbon impact equivalent to your home's electricity use for a month. A single T-shirt may have caused emissions equal to two or three days' typical power consumption. Buying fewer and better things has an important role to play.

Updated at 9.54am GMT

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09:49



Damian Carrington

Turning our attention to the UK, climate change is already affecting parts of Britain, principally by increasing the risk of extreme flooding and heatwaves, and on Wednesday the [government accepted](#) almost all of the current and future risks set out by its official advisors, the Committee on Climate Change (CCC).

The [CCC's report, published in July](#), concluded the UK was poorly prepared for global warming and set out six priority risk areas. The first two were rated as high risk now, with more action needed.

Flooding already causes £1bn of damage every year on average but the risks will rise yet further as climate change leads to more intense rainfall, bringing floods to places not currently in danger. The number of households at significant risk of flooding will more than double to 1.9m by 2050, if the global

temperature rises by 4C.

The [deadly heatwave of 2003](#), which peaked at 38.5C in the UK, will be a normal summer by the 2040s, leading to heat-related deaths more than tripling. There are currently no policies to ensure homes, schools, hospitals and offices remain tolerable in high heat.

Severe water shortages are expected as summers get drier and, by the 2050s, will extend across the UK. If temperatures are driven up significantly, many places in the UK will have a demand for water 2.5 times greater than that available.

[Climate change](#) is likely to drive food prices up, with extreme weather leading to lost crops and price shocks. About 40% of UK food is imported, making the UK vulnerable to droughts and floods driven by climate change around the world.

The proportion of prime farmland is expected to fall from 38% to 9% with significant warming, and crop growing in eastern England and Scotland could be ended by degraded soil and water shortages. Warming seas are pushing key species northwards, which may affect the entire marine food chain.

New dangers may invade the UK as the climate gets warmer and requires urgent research. “The impacts are potentially high for otherwise healthy people, animals and plants,” the report states. “Higher temperatures will lead to an increased risk of the Asian tiger mosquito, the vector of Chikungunya virus, dengue fever and Zika virus. The current risk remains low, but may increase in the future.”

Cars are submerged under several feet of flood water in Hartcliffe, near Bristol, after heavy rain in November 2016. Photograph: Matt Cardy/Getty Images

The CCC also warned that climate-stoked wars and migration around the world could have very significant consequences for the UK, through disrupted trade and [more military intervention](#) overseas.

On Wednesday, [environment minister Lord Gardiner](#) said

Our changing climate is one of the most serious environmental challenges that we face as a nation and that is why we are taking action, from improving flood defences across the country to securing our critical food and water supplies.

Professor Hugh Montgomery, at University College London added:

Acting on climate change can also boost people's health. If we get it right, our

efforts to tackle climate change avoid some of these risks, and directly benefit health: renewable power doesn't generate health-damaging pollutants, for example, while walking or cycling improves health."

And with that in mind, here come some more tips:

Updated at 9.50am GMT

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09:35



James Walsh

We've had some great comments below the line this morning. If you have any questions for our head of environment, Damian Carrington, please post them there. We'll hold an answer session at 1pm.

Herewith some intriguing comments.

Stefana Broadbent wonders about a "spiral of silence" caused by people fearing to speak out:



StefanaBroadbent

19 January 2017 8:07am

Thank you for this front page rolling update. The importance of your constant reminder of the topic is really crucial. In a recent series of studies we saw that people rarely talk about climate change at home or with friends even though they are extremely worried about it.

<https://medium.com/if-you-want-to/silence-about-climate-change-doesnt-mean-behaviours-aren-t-changing-56b1cbdbf440#.rs589m3my>.

This "spiral of silence" is brought about by the feeling that people around us don't share the concern and it could be embarrassing to raise the issue. Your articles therefore not only inform but reassure many of us that the topic is important and we are not alone in our concern. Interestingly we also found that people are silently changing their habits much more than they publicly discuss. This at least is encouraging.

Another Guardian commenter discusses the importance of finding common ground, regardless of wider political stances:



Thelarch

19 January 2017 8:08am

This comment has been chosen by Guardian staff because it contributes to the debate
Thanks Guardian for putting climate change so prominently centre stage for this troubling regime change.

I've been banging on in comment for a while now, that while this transition is extremely depressing there is also are also valuable opportunities.

First , Rex Tillerson is an [advocate](#) of revenue neutral carbon taxation. This is exactly the kind of policy that many [climate activists](#) have been pressing for while without getting any traction with mainstream politicians.

It's an attractive policy because it fits all political persuasions including the ideology of the kind of folks that have just voted for Trump. Lets face it , we weren't doing enough anyway, this kind of radical tax overhaul to reflect the external costs of fossil fuels is the only way forward.

Let's exploit this apparent common ground with a key member of this incoming administration and hold him to his own words.

And this commenter wonders about personal responsibility.



packc47

19 January 2017 8:29am

I haven't flown anywhere for some years for personal or financial reasons. My last trip was to Paris on Eurostar. Most people fly because its cheaper. I would travel everywhere by train if fares were more reasonable. My partner is Norwegian and we did the trip there on the ferry from Newcastle but it no longer runs and he can fly cheaper to Oslo than we can travel from Yorkshire to London. I know several people who have relatives In Australia, New Zealand and Canada. They have to fly. Maybe if alternatives were as cheap as flying we could cut down short haul significantly.

I haven't eaten meat since 1979. I don't miss it. Many people I know have cut down on

meat but more for health reasons.

My problem is my house built in 1916. Its been a financial struggle to maintain let alone insulate it or put in double glazing which seems very poor in the UK. People I know who have it are always complaining that it fails and often needs fixing. I have no cavity walls. I have thick or insulated curtains in most rooms and I don't have heating all day. In the winter I often sit in bed if I'm reading or on the laptop to keep warm. I don't actually like central heating. It bungs up my nose and makes my eyes dry.

And finally [LordInsect](#) asked for a graphic on carbon emissions. I'm happy to say we have two:

Growth in world carbon emissions has stalled for three years

2016 expected to be similar to tiny growth in 2014 and 2015, Gt of CO2
World India China US EU

0
10
20
30



1990
1995
2000
2005
2010

2015

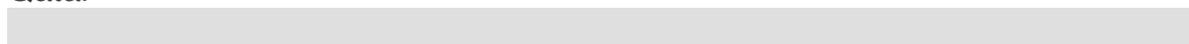
Guardian graphic | Source: Global Carbon Budget

And this:

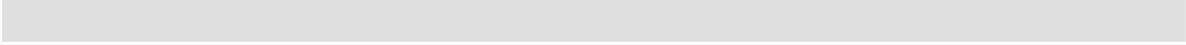
The US, Australia and Saudi Arabia have the largest CO2 emissions per person among larger nations

Top 15 of the world's countries by 2013 per capita fossil-fuel CO2
CO2

Qatar



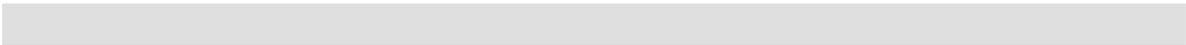
Trinidad And Tobago



Curacao



Kuwait



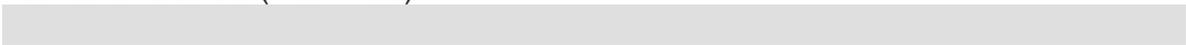
Bahrain



Saint Martin (Dutch Portion)



Falkland Islands (Malvinas)



Brunei (Darussalam)



UAE



Luxembourg



Saudi Arabia



Australia



US



Oman



Gibraltar





0

10

20

30

40

Guardian graphic | Source: Carbon Dioxide Information Analysis Center/Appalachian State University

Updated at 9.43am GMT

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12h ago

09:18



Mark Rice-Oxley

Before we move on to Europe and the UK, this is a neat piece of work from my colleague Nick Evershed, the Guardian's head of data and interactives in Australia. It shows how much carbon we are emitting right now – and how much we have “left to burn” if we want to keep global warming within the 2C band considered crucial by scientists to prevent serious damage to the planet.

Nick's calculated that in just the 24 hour lifespan of this blog, the world will pump out more than 112m tons. Hard to visualise? Well let's let the doomsday clock do the work:

Carbon countdown clock: how much of the world's carbon budget have we spent?

7,968,674,717

Total carbon budget remaining in tons (CO₂-e), if we want to do our fair share to avoid 2°

warming

2,131,325,134

Total carbon budget used since 2013, in tons (CO2-e)

78.9%

21.1%

total carbon budget in tons (CO2-e)

10,100,000,000

The total carbon budget in tons (CO2-e) we have since 2013 to avoid 2C warming, according to the CCA

years, days, hrs, mins, secs

Until we will exceed the CCA's carbon budget, if our emissions stay as they are now

How is this calculated?

One way of looking at emissions targets is as a fixed budget amount, or quota. This countdown shows one estimate of how long it will take to reach an amount of greenhouse gas emissions beyond which two degrees of warming will be likely. The total carbon budget remaining figure of 2900 GtCO2-e (within a range of 2550 to 3150 depending on various factors) is the value required to limit total human-induced warming to less than 2°C relative to the period 1861–1880 with a probability of >66%. Full details are in the IPCC Synthesis Report [here](#). The rate of emissions is based on the most recent year of global emissions, and assumes no increase or decrease in emissions year-to-year as a 'business as usual' scenario

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09:08

HOURLY TWO: Africa – droughts, ice melt and rising tides



Mark Rice-Oxley

So in summary, we've been focussed on Africa over the past hour:

rising [sea levels](#) in Alexandria

[disappearing glaciers](#) in Mt Kenya

an [insurgency partially caused](#) by climate change in west Africa

and [hungry people](#) in the south

And here's another fact for our post-truth world:

[#GlobalWarning](#): livestock are responsible for 15% of climate-warming emissions
pic.twitter.com/OI6nmrKDiH

— The Guardian (@guardian) [January 19, 2017](#)

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12h ago

09:01



Jason Burke

In South Africa meanwhile, an interesting distinction: while you might find plenty of climate change denial in western countries or oil powers, or even in the White House (from tomorrow), it's not a common feature of local conversation here.

Melissa Fourie, executive director of the Centre for Environmental Rights, told me:

In South Africa, there has been very little of the climate denialist narrative you still see in the US and elsewhere. The South African government has been vocal in its commitment to the fight against climate change for many years, and there is a genuine popular understanding of the problem and consequences of climate change.

One reason for that is that ordinary people can already see the effects of climate change very clearly. The devastating drought that has plagued South Africa for the past two years, with ruinous knock-on effects on the rural economy and food prices, is a very real and tangible reminder of our vulnerability to climate change. We really are at the coalface of climate change, so to speak.

Kusile power station - still under construction near the town of Balmoral, South Africa. Photograph: James Oatway for the Guardian
Updated at 9.01am GMT

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13h ago

08:54



Jason Burke

I've been talking to Johannes Wedenig, country representative for Unicef in Malawi about the situation there.

He says climate change is making the weather hotter and more variable.

From 2000 to 2009 droughts effected 8.5 million people in Malawi, and floods affected 1.2 million. From 2010 to 2016 we have already reached 8.4 million people

affected by drought and 875,000 by flooding. So we will see at least a third more over the decade if the trend continues.

But I've seen from my own experience that it's the variability of weather phenomena that poses the greatest challenges to farmers in Malawi, especially when combined with an already fragile situation. People are selling their last assets and so are going into the next cycle even poorer, and unpredictability makes it very hard to plan and adapt.

A family in the village of Mulele, near Zomba, which lies in one of the areas of Malawi most affected by drought. Photograph: Andrew Renneisen/Getty Images

Wedenig says these changes affect the poor disproportionately.

I've travelled widely in Africa but when I got here last year I was really shocked by the amount of acutely malnourished children. You wouldn't necessarily expect to see such a severe impact here but Malawi shows the impact of climate change compounded by other factors such as soil degradation, population pressure and an over-reliance on a single crop (food source) as a result of past policy decisions.

My colleague John Vidal was in Malawi at the end of last year, and wrote movingly about the food shortages there. [Here](#) is his piece.

Updated at 8.56am GMT

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08:46



Murithi Mutiga

In east Africa, concerns are growing that the continent's second highest peak, Mt Kenya, could be totally ice free within decades.

The United Nations Environmental Programme estimates [that 80% of East Africa's glaciers](#) have been lost since 1900. Mt Kenya has [lost 92% of its glacial cover](#) over the last century.

Scientists are divided over the precise causes of the steady retreat of the glaciers but [many blame](#) rising temperatures driven by climate

change.

The consequences have been dire for locals. Glacial melt is one of the contributors to river flow in the region and many rivers have been [drying up in recent years](#).

Seven million people depend on agriculture fed by the vital Mt Kenya water catchment area, which provides the bulk of the tea and coffee exports that are critical to Kenya's economy. The area also hosts heavily visited national parks and reserves.

Sunset in Mackinder Valley and the peaks of Nelion and Batian, Mount Kenya national park. Photograph: P. Jaccod/Rex/Shutterstock

Although Africa has made a [negligible contribution](#) to the greenhouse emissions that cause climate change, many parts of the continent are expected to bear a great burden from the results of climate change.

Mathenge wa Iregi, who as a Gikuyu elder has spent many years offering prayers in the forests of Mt Kenya, says he does not need scientists to point out the dramatic changes upending people's lives and considers the stance of climate-change skeptics like US president-elect Donald Trump baffling.

You just need to open your eyes. Mt Kenya was once a striking and impressive site and we even named it in reference to the glacial cover. Everything has changed within our lifetime. And that is simply because we human beings do not respect nature.

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08:38



Emily Wilson

Guardian columnist George Monbiot is writing today on Trump and climate change.

This is his stark take on things:

Understandably, commentators have been seeking glimpses of light in Trump's position. But there are none.

You can read his full piece [here](#).

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Emily Wilson

Here are three more tips on how to save the planet from author Chris Goodall of [Carbon Commentary](#):

Old gas and oil boilers can be hugely wasteful. Even if your current boiler is working well, it's worth thinking about a replacement if it is more than 15 years old. Your fuel use may fall by a third or more, repaying the cost in lower fuel bills.

The distance you drive matters. Reducing the mileage of the average new car from 15,000 to 10,000 miles a year will save more than a tonne of CO₂, about 15% of the average person's footprint. If car travel is vital, think about leasing an electric vehicle when your existing car comes to the end of its life. A battery car will save you money on fuel, particularly if you drive tens of thousands of miles a year. Even though the electricity to charge your car will be partly generated in a gas or coal power station, [electric vehicles](#) are so much more efficient that total CO₂ emissions will fall.

Two electric cars charging on a street of Glasgow. Photograph: Kenny Williamson/Alamy

But bear in mind that the manufacture of an electric car may produce more emissions than the vehicle produces in its lifetime. Rather than buying a new electric vehicle, it may be better to keep your old car on the road by maintaining it properly and using it sparingly. The same is true for many other desirable items; the energy needed to make a new computer or phone is many times the amount used to power it over its lifetime. Apple says 80% of the carbon footprint of a new laptop comes from manufacturing and distribution, not use in the home.

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Mark Rice-Oxley

Further west, the contraction of Lake Chad over the past four decades has created a very different set of problems for surrounding countries, Nigeria, Niger, Cameroon and Chad. Some experts even blame the rise of Boko Haram on the disruption to traditional ways of life that the changing landscape has brought about.

These maps show just how the lake has diminished over the decades:

Between 1963 and 2005, the surface area of Lake Chad decreased from approximately 25,000 km² to 1,350 km²

60 km
60 miles

Doro Gowon

Lake Chad

Cameroon

Niger

Nigeria

Chad

Chad

Chad

Chad

1963

1987

2013

1972

Guardian graphic

Source: UNEP, DIVA-GIS

Patrick Kingsley visited the region for the Guardian at the end of last year, and found locals blaming the climate as much as the insurgents for the catastrophe that had befallen them.

If the Lake Chad water was normal all these problems [with Boko Haram] would be eliminated economically, because nobody would have time to do all these things,” said Modu Amsami, a displaced person from northeast Nigeria

You can read Patrick’s piece [here](#).

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08:18



Mark Rice-Oxley

Our Egypt correspondent Ruth Michaelson has been to Alexandria to investigate the impact of rising sea levels on the city.

Ruth [writes](#):

On the southern tip of the Mediterranean, the coastal waters are inching closer to buildings and flooded ancient structures, including the Greco-Roman tombs at Anfushi. Seawater seeping into the groundwater has also made the fragile ground more unstable, resulting in the alarming [collapse](#) of some of the city’s buildings.

The UN [estimates](#) that global sea levels will rise between 13cm and 68cm by 2050, and say that the Mediterranean is particularly vulnerable – by 2080, up to 120,000 people living near the sea could be affected by rising waters if no action is taken to protect them.

Rising sea levels and seawater temperatures will also increase the salinity of the Nile, Egypt’s primary water source, and increasingly salty water sources could destroy farmland across the [Nile Delta](#). In 2007, the World Bank [estimated](#) that 10.5% of Egypt’s population could be displaced by rising waters caused by climate change.

Incoming tides in Alexandria. Photograph: Goran Tomasevic/Reuters

She visited the small town of Rosetta – famous for the stone – and found locals struggling to adapt to the unignorable advances of the sea.

You have to do what you have to do, and don't think about the bad weather – the good weather comes from God," a local fisherman, Ahmed Mohamed Gowayed, told her. "Last year the storm destroyed palm trees, buildings, cars – older people in their seventies said they'd never seen anything like it in their lives. If the weather continues like this I will build a stronger kiosk.

You can read Ruth's piece full piece [here](#).

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08:03

HOOR ONE: facts and welcomes



Mark Rice-Oxley

We're delighted to be working with both Tumblr and Univision today. For a version of this blog in Spanish, check out Univision's work [here](#). And to contribute to Tumblr's unique exercise in creating a sort of "climate change quilt", follow [this link](#).

We're also on Twitter, using #globalwarning as a hashtag ...

[#GlobalWarning](#): the world has warmed 1.1C since the 18th century pic.twitter.com/sKN6svpgVk

— The Guardian (@guardian) [January 19, 2017](#)

Right, that's the introductions done. Later we'll focus on climate change in the UK and Europe, but before that we'll turn the focus to a part of the world where climate change is having one of the greatest impacts: Africa.

Updated at 8.04am GMT

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07:46

Eric Hilaire

Before we go any further, let's look at how climate change is actually impacting parts of the world. Run the slider across to see how Arctic temperatures have changed over the past 40 years

Arctic warming

This one shows the dramatic decline of Lake Chad in west Africa, which has been blamed for large scale migration.

Lake Chad

And finally, the gradual melt of the ice sheet in Greenland.

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Emily Wilson

Carbon expert Chris Goodall says individual actions DO make a difference. Here are three of his suggestions for individual action that will cumulatively make a real impact on humankind's carbon emissions:

1 Air travel is usually the largest component of the carbon footprint of [frequent flyers](#). A single return flight from London to New York – including the complicated effects on the high atmosphere – contributes to almost a quarter of the average person's annual emissions. The easiest way to make a big difference is to go by train or not take as many flights.

For the richest of us, flying less is the easiest way to cut carbon emissions Photograph: Nick Ut/AP

2 The second most important lifestyle change is to eat less meat, with particular emphasis on meals containing beef and lamb. Cow and sheep emit large quantities of [methane](#), a powerful global warming

gas. A vegan diet might make as much as a 20% difference to your overall carbon impact but simply cutting out beef will deliver a significant benefit on its own.

3 Home heating is next. Poorly insulated housing requires large quantities of energy to heat. If you have properly insulated the loft and filled the cavity wall, the most important action you can take is to draft-proof the house, something you can do yourself. Those with solid brick or stone walls will also benefit from adding **insulation**, but the financial benefits are unlikely to cover the cost of doing the work, over time.

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Mark Rice-Oxley

First things first – the facts. I know this is the post-fact era, and it's become rather unfashionable to grub around looking for the truth. But here goes anyway:

1) Warming is happening fast. No doubt about it. For most of the 20th century, average global temperatures bimbled around the 13.5C mark. Now they are closer to 15C.

The UK's Met Office has produced a nice visual of this which really brings home how static temperatures were for a long period, before the past 20 years or so:

[Try watching this video on www.youtube.com](http://www.youtube.com)

Getting warm

2) Scientists agree we are doing this to ourselves. Often good journalism involves balancing arguments. If you quote a Democrat, you need a Republican for balance. If you quote someone in favour of

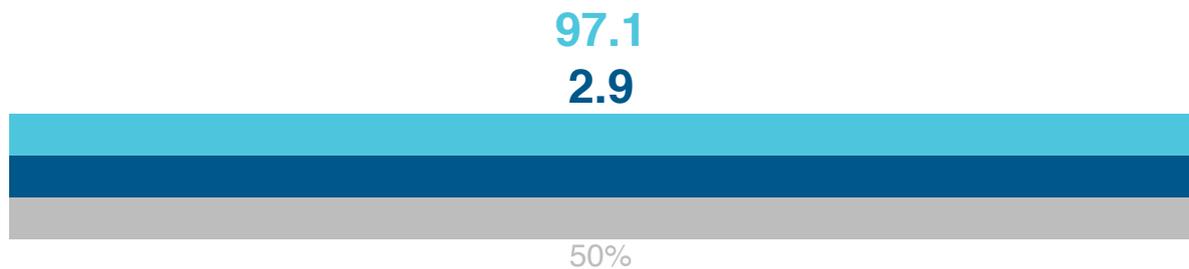
chocolate biscuits, you want a counter view.

This has leached into climate journalism, but the vast majority of scientists support the hypothesis that manmade action is contributing to climate change.

The vast majority of scientists agree: mankind is generating global warming

Scientific papers, 1991-2011, expressing position on anthropogenic global warming

Supporting manmade global warming Disputing manmade global warming



Guardian graphic | Source: Dana Nuccitelli et al

As this chart makes clear, if we want to strike a fair balance of voices in reporting climate change, we need to speak to more than 30 people who believe in manmade climate change before we give a platform to a sceptic. So we will do that today. We will hear from 30 or so people in the former camp. And we will remind you of what the world's most famous climate sceptic, Donald Trump, has said.

3) BUT ... THERE IS HOPE. There are many great things going on. We're going to hear lots about these too: what is happening right now, and what you can do to join the global movement.

Carbon emissions are flatlining (but need to start falling). Renewable capacity has increased exponentially around the world. In [an article we have just published](#), climate expert Chris Goodall writes:

2016 was the year in which it finally became obvious that the world had the technology to solve the problem. Even as the political environment has darkened, the reasons have strengthened for believing that a complete transition to [low-carbon energy](#) is practical and affordable within one generation.

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Damian Carrington

Humanity stands at a fork in the road, with one route descending towards disaster and the other climbing towards a brighter future. The route taken depends on whether the world can tame [global warming](#), which threatens a violent end to the mild and stable climate the world has enjoyed since the start of civilisation.

Many fear the inauguration of Donald Trump as the US president on Friday threatens to push us down the dark path. That's understandable: he has called global warming a hoax and appointed climate-change deniers and [oil barons](#) to key posts.

But the unpredictable Trump and his team have already [stepped back from a threat to abandon the global climate deal](#) agreed in Paris in 2015. Hope remains – just – that with the right advice and pressure, Trump may see the challenge of climate change as the great opportunity it also represents.

Beating climate change requires nothing less than rewiring the global economy to run on zero-carbon energy – work that must start now but will take decades. As the climate economist [Lord Nicholas Stern](#) tells the Guardian: “The urgency and scale is not sufficiently understood.”

But this titanic challenge also offers extraordinary opportunities: trillion dollar markets for green technology and the prospect of a clean, sustainable and fair world. The US is the most vibrant crucible for new technology the world has seen and embracing the transformation to a green economy would deliver jobs and prosperity to many Americans.

New investment in clean energy increased sharply in the past decade but fell by 13% between 2015 and 2016

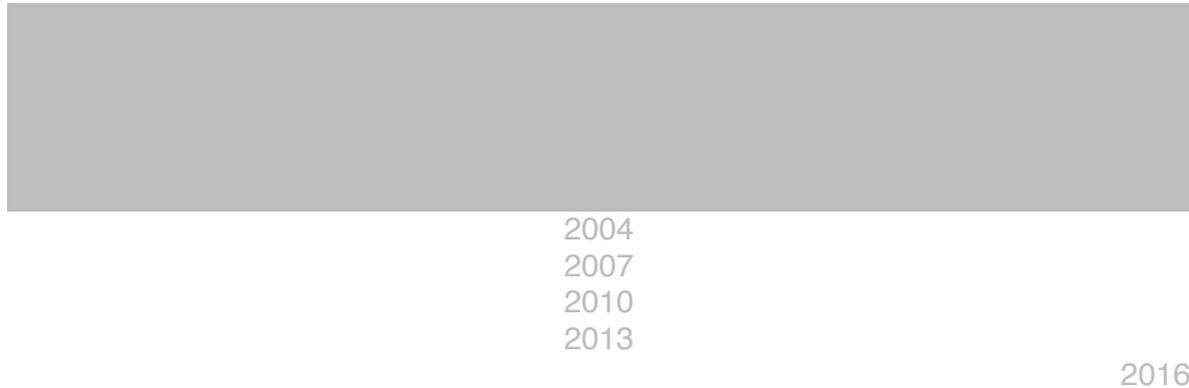
Total annual new investment in clean energy, \$bn

0

100

200

300



Guardian graphic | Source: Bloomberg New Energy Finance. Note: including all asset classes in all clean energy sectors

Will Trump the dealmaker grasp the opportunity before Trump the climate-change denier throws it on a fossil fuel bonfire? Grabbing the chance would be a great way to “make America great again”, as many US cities, states and [US businesses](#) already realise.

In contrast, not doing so will help make China great again, as its extraordinary transformation into a climate leader accelerates.

Indeed the rest of the world’s nations have shown they remain resolute in pushing on, with or without the US. Even [Saudi Arabia](#), which for years frustrated global climate talks, is now [backing the renewables revolution](#) with billions.

The prize of beating climate change is a glittering one and still just within reach. Global carbon emissions have levelled off. But that only means we are no longer accelerating towards the climate cliff edge – just speeding along at a steady 100mph towards the “[severe, widespread, and irreversible impacts](#)” projected by the world’s scientists.

A foretaste of those severe weather impacts has already arrived in many places, via scorching heatwaves and floods made far more likely by the overheating planet. To avoid climate breakdown, emissions must fall to zero in a few decades at most and that means ramping up action right now. Given the scale of the challenge, people can feel powerless to make a difference. But ask the key players around the world what individuals can do and one answer recurs more than cutting down on flying, giving up meat and saving energy: demand action from your elected representatives today.

Updated at 7.18am GMT

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07:03

What we're doing today



Mark Rice-Oxley

Hello and welcome to this live climate change special, in which we will be reporting from all seven continents on the climate change already underway – and the promise of solutions – in one 24-hour period.

The plan is this: starting in London, we will generally follow the sun as daybreak falls around the world. We'll be in Europe, Africa and the Middle East for the next few hours before crossing the Atlantic to look at the Americas during their morning.

And finally we'll move down to Sydney to hear about Asia-Pacific as that part of the world wakes up on Friday morning. All building towards Donald Trump's big moment in Washington later in the day.

We're teaming up with social network Tumblr and [Spanish-language US broadcaster Univision](#) to cast the conversational net far and wide.

Of course, Trump is on record as questioning the science behind climate change, and the link between the warming planet and the transformation of our weather patterns.

But we'll hear from people who, unlike Trump, live on the front line of climate change –in Bangladesh, Egypt, Canada, Bolivia, Malawi, the South Pacific – parts of the world where climate sceptics (or doubters, if you prefer that word) are few and far between.

Already today we have heard from [more than a dozen top global warming experts](#) who pinpoint why Trump's revisionism is not just dangerous but a self-inflicted wound. And we have heard Xi Jinping, China's president, [wax lyrical](#) about the urgency of the moment:

There is only one Earth in the universe and we mankind have only one homeland ...

It's not all gloom though. There's a tremendous amount of work – science, innovation, activism and diplomacy – that should give readers hope. We'll be highlighting the saviour technology that can yet make a big difference and the little things you can do in your life to join the climate movement.

Other highlights will include a [quiz](#), a [doomsday carbon countdown clock](#), a Facebook live attempt to sketch climate change, and a film from the bottom of the earth.

Our icons will indicate what each post is about, whether it's drought, heat, oceans, flooding, food or ice melt – or just advice or commentary.

So drop in from time to time, and see how we're getting on. After all, in the time it's taken you to read this, we've churned out another [100,000 tons of carbon](#). Next up will be Damian Carrington our head of environment, on why this is such a critical juncture for our species, and indeed every species on this planet.

We'll be reading all comments below the line, please do join the conversation.