



## Background

At COP21 in 2015, world governments collectively agreed to limit global warming to well below 2°C relative to pre-industrial levels and to pursue efforts to limit global warming to 1.5°C. This was further referenced in the Glasgow Climate Pact at COP26 in 2021, when governments committed to ‘keeping 1.5°C alive’.

In the lead up to COP27 in Sharm El-Sheikh, Egypt, the Met Office hosted a webinar to consider whether we are on track to limit warming to 1.5°C, also exploring overshoot and the co-benefits of tackling climate change. We were joined by speakers from University College London, the University of Leeds and the UK’s Department for Business, Energy and Industrial Strategy (BEIS).

## Key webinar talking points

### Are we on track to keep warming below 1.5°C?

Every major report published this year from the Intergovernmental Panel on Climate Change (IPCC) along with the United Nations Environment Programme (UNEP) Emissions Gap Report 2022 have shown progress on bringing warming projections and emissions down.

The Nationally Determined Contributions (NDCs) submitted since COP26 suggest six gigaton equivalent lower CO<sub>2</sub> emissions in 2030 compared to the NDCs submitted in 2016. We also know that emissions are rising more slowly than during the previous decade, and that at least 18 countries have collectively reduced their emissions over a sustained period. The International Energy Agency’s (IEA’s) World Energy Outlook 2022 report also indicated for the first time a pathway that shows emissions peaking this decade due to policies put in place because of the energy security crisis globally.



However, while some progress is clearly being made, it is very limited progress. Every fraction of a degree counts towards achieving the Paris temperature goal and avoiding the worst impacts of climate change, but while it is still possible to restrict warming to 1.5°C, we are currently not on track to achieve this without overshooting.

Global greenhouse gas emissions based on NDCs and pledges after COP26 would still lead to an emissions gap of between 19 and 25 gigatonnes of CO<sub>2</sub>e (CO<sub>2</sub> equivalent) in 2030 (UNEP GAP report, 2022). This gap represents the difference between where we need to be to have a better than 50% likelihood of meeting the 1.5°C warming level without overshoot and the current pledges. The IPCC 6th Assessment Report (AR6) came to a similar conclusion and the recent UN Climate Change (UNFCCC) NDC synthesis report noted that current policies were currently on track for 2.1-2.9°C warming, with 2.5°C their best estimate. This means that even if we fully implement submitted NDCs today, we will still see 2.5°C by the end of the century without further ratcheting of effort post 2030. And even if we combine those with the net zero pledges that have been made, an optimistic estimate suggests we'll still see warming of around 1.8°C in 2100.

To hit the 1.5°C target, we know that we need to act now. We know that emissions need to peak by 2025 and need to nearly halve by 2030. Countries are strongly encouraged to ramp up their ambition through submission of updated NDCs and we reiterate that this is essential for meeting 1.5°C.

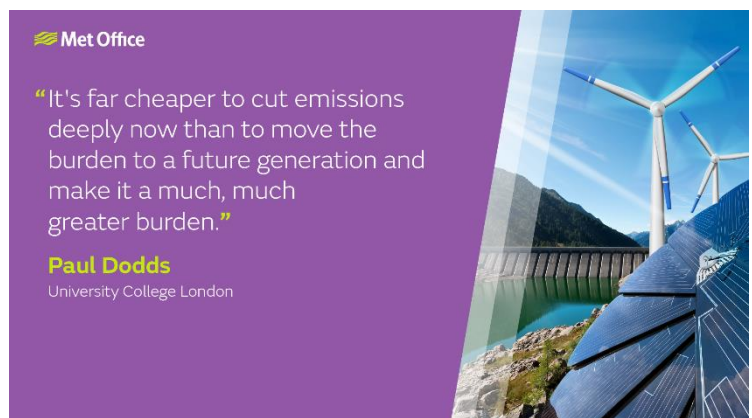
The global stocktake is a key focus at COP27 and will finish at COP28 in 2023. The global stocktake is a process where countries come together with IPCC and other science input to assess collective action and ratchet effort towards the long-term goals of the Paris Agreement. When it finishes next year, it should help countries understand where the gaps are and help us move towards accelerated action and drive ambition.

### Overshoot

Some of the pathways which exceed or overshoot 1.5°C still leave the possibility of bringing long-term warming back beneath this threshold. The longer, however, that we take to reduce current emissions, the greater the negative emissions needed towards the end of the century to achieve this return to below 1.5°C of warming.

To bring the temperature back down to 1.5°C, we will need negative emissions technologies. These include:

- afforestation: planting new trees to take CO<sub>2</sub> out of the air;
- biomass with carbon capture and storage: using biomass as a fuel to generate electricity or producing hydrogen and sequestering the CO<sub>2</sub> that is produced; and
- direct air capture: where CO<sub>2</sub> is taken directly out of the air and sequestered or used to produce synthetic fuels.



For very high overshoot, we would need 37 gigatons per year of negative emissions at the peak, which pushes the boundaries of what is feasible. The cost of bringing temperatures back to 1.5°C in an overshoot scenario could also be extremely high. By 2080-2090, as much as 50% of energy

system costs could be spent on negative emissions technologies, which would be a huge cost to the global economy. It would be cheaper to cut emissions deeply now than to move the burden to a future generation and make it a much, much greater burden.

Overshooting 1.5°C would also cause significant impacts such as higher mortality, greater infrastructure damage, more frequent flooding, reduced crop yields and an increased probability of tipping points or events that are high impact but low likelihood (HILL). Even if the overshoot were reversed, only some of those impacts would be reversed. For example, impacts related to atmospheric circulation and extreme rainfall reverse relatively quickly, but the impacts in the poles and in mountains and coastal ecosystems tend to be either very slow (over centuries) or don't reverse at all.

### Mitigation and adaptation

Reducing the likelihood of exceeding 1.5°C of warming requires a rapid move away from the use of fossil fuels. We need to see a 90% reduction in the use of coal, 60% reduction in oil use, and 45% reduction in gas use by the middle of the century. We need the accelerated development of clean technologies and, in order to actually achieve net zero, we need to make sure that we have the removals technologies to balance out the hard to abate sectors. Delaying emissions reductions means further reliance on those technologies which carry big questions over scalability and sustainability.

There are lots of opportunities around reducing emissions. Since 2010, the cost of many renewables has plummeted, in some cases faster than anticipated. This is thanks to policies that are focused on innovation and their deployment has increased enormously. For example, solar PV (photovoltaic) and onshore wind are both now the cheapest source of new power generation in countries that make up 2/3 of the world's population. There are also many opportunities within cities through the use of green

technologies in industry, buildings, sustainable land use, and transport. There are also many demand-side opportunities available to us, for example through improving energy efficiency in buildings, shifting to electric vehicles, dietary shifts, urban planning - all of these options can reduce greenhouse gas emissions in end-use sectors by up to 70% by mid-century. And a lot of these are responses and interventions that can improve well-being for everyone.



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“Even if we were to reach net zero tomorrow, we're facing impacts that we'll need to adapt to or cope with. The faster we can mitigate, and the more steeply we can mitigate, the easier adaptation is going to be.”

**Professor Lea Berrang Ford**  
University of Leeds

The image shows a rooftop garden with various plants and flowers. In the background, a city skyline is visible under a clear sky. A person is seen from behind, looking at the plants.

There are also different ways of reducing emissions, depending on your context. Different approaches can be chosen to fit with what's happening locally and what will work locally. There is, however, a gap in public knowledge about the scale of the challenge we face and some of the big changes that people need to make in their personal lives. Many people feel committed to climate action because they are recycling or using LED light bulbs, but people also need to consider replacing their boiler with a hydrogen boiler or a heat pump or shifting to an electric vehicle.

Even if we are to reach net zero tomorrow, we are still facing impacts that we'll need to adapt to or cope with. Adaptation is therefore also critical. The faster we can mitigate, and the more steeply we

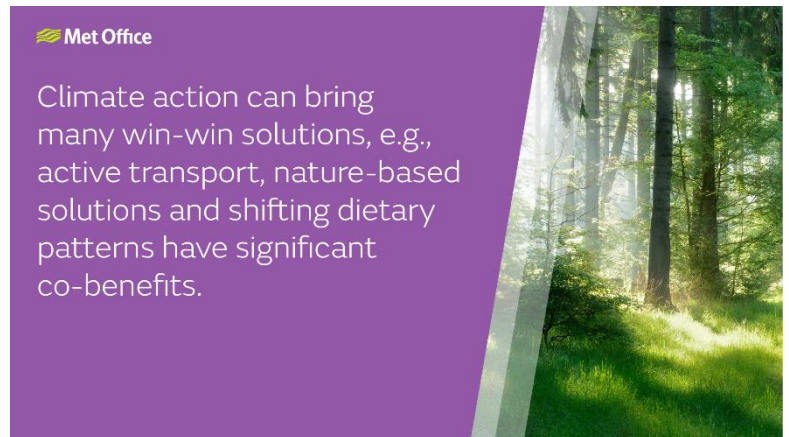


can mitigate, the easier adaptation is going to be. We have to be looking at mitigation and adaptation and vulnerability together to combat some of the severe risks of a changing climate.

It is also important to recognise where trade-offs may occur. For example, one of the quite effective adaptation options for extreme heat would be air conditioning. However, that increases energy use and is not aligned with mitigation options, so there are a significant number of areas where we have to recognize trade-offs across these priorities and look for synergies.

### Co-benefits of climate change action

When we're talking about mitigation and decarbonization goals, the success of those is going to be largely determined by whether those particular actions generate trade-offs or co-benefits with adaptation and development goals. So even if one particular action appears to be effective from a mitigation standpoint, if that generates significant trade-offs, it can be counterproductive. It's critical that as we move forward with pathways to 1.5°C, we're making sure that those pathways and those choices are also carefully aligned with adaptation goals and that any action we take maximises benefits and minimises trade-offs.



Climate action can bring many win-win solutions. For example, active transport, nature-based solutions and shifting dietary patterns have significant co-benefits. In many cases, these co-benefits are also realised very quickly. For example, health and energy security benefits, as well as cost benefits, can be felt immediately.

People are very focused on the cost of energy crisis at the moment, but this also presents an opportunity to take climate action. It's clear that we need to shift away from fossil fuels, and we know that in the UK renewable energy and heat pumps, for example, can reduce costs for everyday consumers and make life better for them.

### **Final summary**

We know that the cost of action is far outweighed by the cost of inaction, and we know that the economic and social benefits of delivering net zero within the UK and globally far outweigh the investment and the change required. Early and ambitious action to tackle climate change can help maximize the co-benefits for people, for society and for the economy, as well as keep 1.5°C alive with little or no overshoot.



The UK's Climate Change Committee (CCC) said in 2018 that net zero would cost the same as their initial estimate for the costs of an 80% reduction target. Over the last year, as gas prices have increased exponentially, they have assessed that delivering the UK's net zero target could now carry a net negative cost. The cheapest way of preventing the most damage is to mitigate as fast as we

can. A more holistic perspective also includes a cost-benefit analysis of mitigation versus the cost of future damages caused by climate change.

We know that the barriers to keeping 1.5°C in reach are political. They're not scientific, they're not technological. We know what needs to be done. We need greater ambition and action from national governments. We need immediate action in the next few years, and we need to make sure that we've got investment in the right places to accelerate technological changes. And action also needs to be taken at all levels – we need local governments, civil society, non-state actors and all parts of society to act. This action needs to be mainstreamed and part of every decision we make across society.

If we start delivering now, we will see benefits. We'll see benefits in the UK in terms of growth and jobs. One estimate suggests that the UK's efforts towards net zero have already resulted in around 70,000 new jobs being created. Co-benefits also include improvements to global health, sustainable livelihoods and sustainable agriculture, and there are opportunities for the UK to be a global leader.