National Emergency Briefing

Transcript: Extreme Weather

Professor Hayley Fowler - Professor of Climate Change Impacts at Newcastle University and one of the UK's leading experts on extreme rainfall and flooding

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Good morning everyone. I'm speaking today in my professional capacity as an academic at Newcastle University.

In September 2024, Storm Boris caused record-breaking rainfall across six countries in Central and Eastern Europe. It overwhelmed rivers, it caused multiple dam collapses and destructive flood waves... and damages exceeded €2 billion. Storm Boris isn't an isolated case. Europe has been hit again and again by severe floods in recent years.

Do you remember Germany in 2021? Nearly 200 people were killed in one of the deadliest European floods in decades. The same weather system triggered those dangerous flash floods in London and in Valencia in October 2024. Three quarters of a meter of rain fell in just 24 hours. It caused flooding that claimed 220 lives.

Storm Daniel in 2023 inundated Greece - it flooded a fifth of its agricultural land and then it intensified into a 'medicane' - that's a Mediterranean hurricane - and it killed over 5,000 people in Libya. These events are not warnings of what might happen in the future. They're actually examples of what's happening right now.

So what's happening to our weather? I grew up in a small village in the Peak District. Winters meant deep snow, school closures, and summers were warm but rarely hot. But the climate we live in today is not the same as when I was born. In those 50 years, our use of fossil fuels has dramatically increased the concentration of greenhouse gases in the atmosphere.

These trap extra heat, loading the atmosphere with more moisture. It drives warmer, wetter winters, hotter, drier summers, and it supercharges extremes - storms, downpours - which increase much faster than average weather.

By 2050, 1 in 4 properties - 8 million in England - will be at risk of flooding. And new research by my group shows that UK winter rainfall has increased by 10% since 1980 because of the fossil fuels we're putting into the atmosphere. Now, an extra 30mm of rainfall each winter sounds really small, but across the UK that's 7.3 billion cubic metres of extra water.

It's the same as 3 million Olympic sized swimming pools with an effect on flooding. This trend is some 25 years ahead of global climate model predictions, and that's concerning.

The extreme heat of 19th of July 2022 - you'll remember that... My garden in Newcastle upon Tyne was 37.6 degrees that day. Astonishing. Across the UK, records were shattered. Temperatures over 40 degrees were recorded for the first time. It caused around 3,000 excess deaths.

Now, the Met Office says there's a 4% chance already of another 40 degree sunny day next year, and that probability is rising really fast. In fact, heatwaves in Europe are intensifying faster than anywhere in the world and much faster than climate models predict.

Hot, dry summers threaten our water security as well. Many of you will have noticed this year. They overstretch healthcare systems and they bring a new danger to the UK - wildfires. These now happen on heathlands, forests, even on the edges of cities. And earlier this year, a wildfire in Dorset was so severe that 17 fire services had to respond.

UK fire services no longer have the resources to keep the public safe in extreme heat. And as heatwaves get longer and hotter, fires will become more common.

But what we're seeing in today's extreme weather isn't random. It's linked to changes in the mid-latitude jet that drives weather systems over the UK. The jet stream is becoming increasingly unstable. The Arctic is warming four times faster than the global mean, and this weakens the temperature gradient between the equator and the pole. This difference is actually what powers the jet. A weaker jet can become wavier and slower. And when these large meanders get stuck in place, they create what we call blocking patterns, which store weather systems over the same region for days or even weeks.

So what we see are heatwaves that persist for longer, fueling wildfires, we see slow moving storms triggering these catastrophic floods. And we saw this vividly in the summer of 2021, a record shattering heatwave in western North America, huge floods in Western Europe and China, and extreme heat and wildfires in Siberia.

Different regions, different hazards. But the same underlying driver: a blocked jet that traps weather systems. And we see this pattern repeating again and again.

But climate models underestimate these blocked jetstream events, and they likely underestimate their future occurrence. So I'm often asked: could these European style mega floods happen here?

The honest answer is yes. There's no physical reason why not. These storms can produce two thirds of a year's rainfall in just a couple of days. So over London, that would mean about 35cm of rainfall falling over a large area. So to put that into perspective, that's three times the rain that fell in Monmouth during Storm Claudia earlier this month. A flood of this scale will be a national crisis.

But like people in Germany, we can't imagine it until it happens. So can you imagine fast moving meters deep water tearing through low lying streets into your front room, the

overwhelmed sewer spilling into that water, transport networks shutting down, cars and even houses swept away. And imagine power outages cascading into communication failures. And a lot of this might happen when it's dark.

Recovery wouldn't take weeks. It would take years.

And there's also a structural risk we can't ignore. England has over 2,000 raised reservoirs, many built more than a century ago and designed for what was then a 1 in 1000 year rainfall event. But these extremes are no longer rare. The probability of dam overtopping is increasing.

Our infrastructure was designed for a climate that no longer exists.

And imagine if a Storm Boris scale event struck the UK today. Could we manage it? I focus so far on extreme weather in Europe, but countries in the global south have been living with greater impacts for years. What's changed now is how fast these extremes are escalating.

Take Pakistan: in May 2024, temperatures in Sindh reached 52°C. At that temperature, when combined with high humidity, the human body can't any more cool itself. A healthy person resting in the shade can die within hours.

We're now approaching this limit to human survivability in parts of South Asia.

And extreme events in the global breadbasket are causing spikes in food prices. My colleague, Professor Behrens will explain why food security can no longer be taken for granted. In the UK, we import roughly half our food and around 40% of our energy from overseas. So global weather extremes are a direct risk to families here at home, to the economy and to national security.

Yet the UK is not prepared. The Climate Change Committee's latest assessment is very clear. The UK is not adapting fast enough to a rapidly changing climate. Despite having a national adaptation plan, progress on the ground is far too slow. Across all sectors assessed, not a single outcome was rated as being delivered at a good level. Meanwhile, the risks are growing rapidly, as I've shown.

The committee highlights three major gaps: weak governance, unclear responsibilities, and insufficient funding. They recommend that adaptation needs to be mainstreamed and embedded into key government decisions, spending reviews and infrastructure planning. Adaptation plans must deliver at pace with the resources to back them up. But in the UK, we're still building infrastructure that isn't resilient to today's climate - never mind tomorrow's.

And we're not adequately addressing cascading climate risks and failures either. So imagine a wind storm knocks out power. It shuts down pumping stations, cutting off water supply for days. Communication networks are affected. Roads become impassable, emergency

services can't get through. This is not something that's happening in the future. This systemic disruption already happened in Storm Arwen and it's becoming more common.

And what if another event hits before services recover? We risk sliding into a state of permanent crisis management, always reacting, never catching up.

Every year we delay urgent investment in resilience and emissions reductions, the window for successful action gets smaller. But we can imagine a better future. First, we need urgent action to cut emissions.

It's sobering when you realise that this is the least extreme climate you will experience in your lifetime. I'll let that sink in.

Until we stop burning fossil fuels, extreme weather will continue to get worse. So cutting emissions isn't enough. It isn't a choice. We must also adapt to protect people and livelihoods. And that means: upgrading flood defenses and drainage to cope with more intense rainfall; retrofitting homes to withstand extreme heat and cold; stress-testing critical infrastructure so it keeps going during extreme events; investing in modern early-warning systems to save lives; and building local resilience in communities.

A safer future is still possible, but it requires urgency, coordination and sustained investment. The good news is that adaptation doesn't just keep us safe. It improves wellbeing.

So insulation doesn't just protect people from extreme temperatures. It cuts energy bills, reduces emissions, improves health, especially for people in low quality housing. And planting trees and building flood-absorbing parks not only reduces flood risk, but it cools cities, it cleans the air and it gives people green spaces that boost wellbeing and biodiversity.

Take Copenhagen - after being hit by devastating floods in 2011, the city reinvented itself as a sponge. Streets now divert water from homes, and parks transform into temporary lakes during storms. The result is a city that's greener, healthier and far more livable. And adaptation pays for itself. Every pound we invest now saves many more pounds in avoided damage and disruption.

And it also creates skilled jobs. Adaptation is a triple win. Good for the economy, good for communities and good for nature.

So to close... extreme weather is not a future problem, it's already changed significantly, it's getting worse fast and we're not prepared.

But we have an opportunity for change. We have the science to understand what's happening, the tools to build resilience, and we know what works. But what we need now is the courage to commit to urgent action.
Thank you.