National Emergency Briefing

# Transcript: Tipping Points

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Thanks for being here. I'm Tim. I'll walk you through why, if we carry on the current trajectory to three or maybe four degrees of warming later this century, then we'll definitely be in a national emergency, because we'll be at a high level of likelihood of crossing a tipping point in the climate that will make this country a very different place - a less habitable place to be, and that we've only really got one credible way out of that kind of risk and trouble.

If you're wondering what a tipping point is, you could just lean back on your chair to that balance point where you know that a small change is going to make a big difference to your state or your fate. There'll be a self propelling change from one stable state of the system to another.

What I'm doing in the movie here [referring to slide] is a bit more subtle.

We've got a system that's got two different stable states, like the chair. It's in the one on the left, but we're forcing it in a way that that initial state gets less and less stable, less resilient, until at some point, some strong amplifiers in the system support a self propelling change from one state to another. What are the qualities of that tipping point change?

Well, it's pretty abrupt as you can see, it's self propelling - I didn't have to keep forcing the system - it would just carry on under its own momentum, and it's pretty difficult to reverse once it's under way. Now, tipping points can happen in all kinds of complex systems, including the climate and the economy and societies. There's a bunch of tipping points in the climate that I've spent 20 odd years kind of documenting and telling everybody about.

There's plenty, sadly, of evidence that, as we'll see, that we're heading towards several of these tipping points. They also interact. We're living in a beautiful, complex, almost living, Earth system where tipping one thing can affect the likelihood of tipping another. And unfortunately, this system is wired up in a way where it's more often the case that tipping one thing makes tipping another more likely.

So we've heard about unprecedented warming of the Arctic. That's causing a bunch of consequences, including the accelerated melt of the Greenland ice sheet. We've got freshwater pouring off the Greenland ice sheet. That's one of the things, along with that Arctic warming, that's contributing to a measured slowdown in the great overturning circulation of the Atlantic Ocean, which we'll come back to in a minute, because that's the big risk for us, if that tips.

And so on. I won't run through all of these interactions. The problem is we risk at the worst case, a bad tipping cascade where we lose control, essentially of the climate problem, and we've got damaging changes just propelling one another.

So I recently published a Global Tipping Points report 2025, telling the world that whilst we're here at about 1.4°C of global warming at the moment and heading to 1.5° around 2030, we've already crossed a tipping point for the world's coral reef ecosystems that support the livelihoods of around half a billion people and protect many coastlines from rising sea levels and storm surges.

We met in Belém, in the Amazon, in the knowledge that we are now, as we head over 1.5°C of global warming in the near future, at risk of tipping a loss of the Amazon rainforest. That isn't just a catastrophe for nature, but it adds a lot of carbon to the atmosphere and removes a lot of reflective cloud cover.

So it adds to global warming for all of us.

I want to concentrate on the things that are in the middle [of this graphic] - some big risks we're already running - of tipping points where we'd essentially stop two key parts of a process we call the formation of deep water in the North Atlantic Ocean. And then this causes ultimately a tipping point and a thing that we esoterically call the Atlantic Meridional Overturning Circulation, or AMOC for short. But you really want to know about this.

So just remember the acronym AMOC. We've all heard of the Gulf Stream. Hopefully you recognise that as part of a red warm water flow heading north eastwards across the North Atlantic. But you can see it's part of this bigger loop, a sort of red to blue loop, which is the great overturning - we call it - circulation of the Atlantic.

So this red thing is a surface current heading northwards, transporting masses of heat to where we are and giving us our nice, mild, equable climate, especially winters. But you see, either side of Greenland, something happens called deep water formation. Those waters that are heading north are losing heat, and they're evaporating freshwater to the atmosphere. That makes them colder and saltier and therefore denser. And either side of Greenland, they get so dense that these waters sink from the top of the ocean to thousands of meters down. And that propels the blue path, which is cold water heading back thousands of meters down in the bottom of the Atlantic and closing the loop.

If you lose that deep water formation, you can tip off this great overturning, and I'll show you in a minute what that will do to our climate.

We already know this circulation is weakening. We know it has switched on and off without human activities 25 times during the last ice age. We know the dramatic changes in climate that brought to our parts of the world. And unfortunately, this circulation can pass, and does pass a tipping point in a bunch of the state-of-the-art climate models that we run.

I'll just show you an example of one of them. In this one, it's happened around two degrees centigrade of global warming. On the right, you're seeing a remarkable comeback of the Arctic sea ice cover that happens if we cross this tipping point, with the sea ice reaching down to The Wash and covering most of the North Sea by February each winter.

On the left is some information about what the decadal winter climate extremes will be if we've crossed this tipping point. In London, it's -20°C in three frozen months of the year, and in Edinburgh it's -30°C in five and a half frozen months of the year. And yet the summers will still be hotter than today because it's a two degrees warmer world, not a 1.4 degrees warmer world.

So the seasonality of the UK, the climate, is like nothing we've ever seen before. It's radically increased. We've previously looked at what this would do to some basic things like land use and food production.

And the simple version is it eliminates the possibility to grow crops in the UK. So instead of being a bit over 50% dependent on food imports, we'd be nearer, perhaps nearer 100%.

But that will be possibly the least of our worries because there would be a major water security crisis. We calculate that there'd be not enough water from the winters to get through the summers in the south east of England, where most of the people are like us today.

And then in the global context, this is a simple calculation of what passing this tipping point does for the viable areas for growing two major staple crops, wheat and maize, worldwide, and they're reduced by more than a half.

So it's a global food security crisis.

So the overarching message from that… We're running an increasing risk of these tipping points, including this critical one to the UK. That risk goes up markedly with every fraction of a degree of warming and every year over 1.5°C. So we've got to do everything in our power to limit the amount of time we spend over 1.5°C and the amount of temperature we go over 1.5°C.

My closing case to you is going to be that that requires a radical acceleration of action towards zero emissions. And the only way we can really convince ourselves that that's credible is if I can convince you that there are also what I call positive tipping points, where the change towards zero emissions technologies and behaviours can itself become self accelerating.

So it's just like the original movie [referring to slide]. There are different stable states of the economy and society. We're in this predominantly fossil-fuelled state of the economy, but we can all picture a different economy and society powered by clean, renewable energy and a bunch of other things besides.

There's certainly a barrier or a hilltop between those two states, but we've already seen how in some sectors and in some nations how actions, including policy actions, can lower the hilltop, can destabilise the fossil fuel status quo, and can activate amplifiers within the system that then create a self-propelling change from the old, emitting, dirty way of doing things to the to the clean, low emissions way of doing things.

And we've done that in the UK. We've done it in the power sector at least. So the black line is coal burning contribution to UK electricity production. At the peak in 2012, we got 40% of our electricity from coal burning. How much do we get today?

Zero, because we shut the last coal burning power station.

How did that tipping point happen? Well, we had a Climate Change Act and a cross-party consensus and a commitment and incentives to do the rollout of new renewables - the green, the blue, the yellow here - that now give us more than 40% of our electricity.

But the falling off the cliff for coal burning also happens because something called a floor price on carbon was put, was levied just on the power sector, with the promise from the Government that it would only ever be stepped up over time.

And it was a pretty modest price, but it was enough to make coal burning become unprofitable. Then people start withdrawing investment from it, which makes it even less profitable. And you get a self amplifying tipping point. In the global context, clearly we need to do more than just positively tip to clean energy. The power sector is about a quarter of global emissions.

We need to tip things like home heating that we've heard about. We need to electrify personal transport and goods transport. There's four sectors there - power, cars if you like, trucks, home heating. In state of the art modeling, we model 72 world regions, hundreds of different technologies, the coupling between the sexes, the way that feedbacks are reinforcing change between the sectors - there's a lot of information on the slide.

But the take-home message from it is, if we want to see positive tipping points across these crucial sectors that make up a large fraction of total emissions, then the most effective policies to bring them forwards are mandates to phase out the fossil fuel technology and phase in the clean technology.

So we're talking here about the ban on petrol and diesel car sales from 2030, we’re talking about, correspondingly, banning gas boilers from a point in the future, banning diesel trucks from 2040. What that does is it activates the amplifiers in the system that we all should be witnessing in the global economy, which is the more we adopt the clean technology, the better and the cheaper it gets.

We're already in a world where renewables, together with battery storage, are the cheapest source of electricity worldwide. Electrification of transport is rapidly becoming the cheapest

and the best option. We need the policies that bring forward the positive tipping points that can accelerate us out of trouble. So it's a narrative of: from emergency, or peril, to prosperity.

This message is, I think, fairly easy to summarise. I think I've shown you the risks. We're running those, in a global and in a national sense, of crossing some tipping points in the climate, and I'd emphasise this tipping point in the Atlantic Ocean circulation.

I probably should have told you that if we go anywhere near 2°C, then the odds of crossing that tipping point are definitely worse than Russian roulette, which is one bullet in the six canisters of the gun. And that tipping point will be at least 'as likely as not' if we go anywhere near 3°C of global warming. So we have to limit warming - or do our bit to limit warming globally if we want to limit that emergency risk for the UK.

And we need civil society - us - and policy working together to trigger the tipping points, the positive tipping points, that can limit that risk and accelerate us to a clean and more prosperous future together.

Thank you very much.