Liability for climate change

Will it ever be possible to sue anyone for damaging the climate?

Myles Allen

As I write this article in January 2003, the flood waters of the River Thames are about 30 centimetres from my kitchen door and slowly rising. On the radio, a representative of the UK Met Office has just explained that although this is the kind of phenomenon that global warming might make more frequent, it is impossible to attribute this particular event (floods in southern England) to past emissions of greenhouse gases. What is less clear is whether the attribution of specific weather events to external drivers of climate change will always be impossible in principle, or whether it is simply impossible at present, given our current state of understanding of the climate system. The issue is important as it touches on a question that is far closer to many of our hearts than global sustainability or planetary survival — who to sue when the house price falls?

At the heart of the problem is the distinction between weather and climate. As Edward Lorenz put it, "climate is what you expect, weather is what you get". In the twenty-first century, climate is what you affect, weather is what gets you. Climate means 'possible weather', or what a statistician would call the 'expected weather' and its variability for a particular time of year, given all the properties of the ocean–atmosphere system, current levels of greenhouse gases, solar activity, and so on. The 'attribution problem' for externally driven changes in climate (as opposed to specific weather events) boils down to questions such as: "what would the climate have been like had we not increased greenhouse-gas levels?" This is a well posed question to which, if we define climate rigorously to encompass all the properties of the 'attractor' of atmospheric and oceanic weather, there is only a single answer.

In practice, all we can ever observe directly is weather, meaning the actual trajectory of the system over the climate attractor during a limited period of time. Hence we can never be sure, with finite observations and imperfect models, of what the climate is or how it is changing. This uncertainty can nevertheless be rigorously quantified, allowing formal probabilistic attribution statements. For example, the recent Third Assessment Report of the Intergovernmental Panel on Climate Change (IPCC TAR) concluded: "most of the observed warming over the past 50 years is likely [meaning, specifically, a better than two-in-three chance] to have been due to the increase in greenhouse gas concentrations."

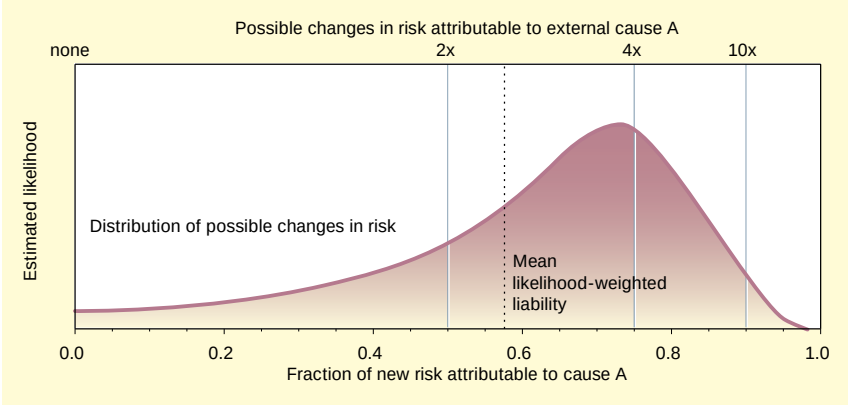

Figure 1 **How we might be able to calculate liability for climate change. We will never know exactly how external drivers of this change, such as greenhouse-gas emissions, alter the risk of undesirable events, such as floods, but this does not prevent us working out a 'mean likelihood-weighted liability' by averaging over all possibilities consistent with currently available information.**

Not only is climate difficult to observe, but in most cases it is weather events that actually do the damage — for my neighbours in Vicarage Road, the information that we have a rigorous attribution procedure for changes in an unobservable attractor may seem of limited interest. Their feelings are running high, so let me explain at once that the science of detection and attribution may nevertheless have something to offer them. In a perfectly efficient and well-informed insurance market, premiums for flood-risk cover should be determined by the risk of flooding, which is a property of the climate, not the actual weather in any particular year (this assumes that seasonal forecasting never reaches a level of accuracy where insurers can adjust their premiums in the light of the forecast for the coming winter). So if insurance premiums rise as insurers factor in the increased risk of flooding due to climate change, and house prices consequently fall, some of this loss can straightforwardly be blamed on past greenhouse-gas emissions.

But how much? Any compensation settlement would have to define what fraction of a given loss was due to human influence on climate, and what fraction might have happened anyway, or happened for other reasons (for example, farmers upstream reducing the water-carrying capacity of their land). Of course, there are an infinite number of answers to this question, depending on the level of confidence required. Attribution statements, however rigorous, always need to be qualified with some level of probability, such as the two-in-three chance quoted above. As there can be no such thing as fuzzy compensation, how could such evidence be used in a settlement?

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One approach to this problem is illustrated (Fig. 1). The curve shows how some external driver of climate change, such as past greenhouse-gas emissions, may have increased the risk of an undesirable event, such as the floods in Vicarage Road. There will always be some uncertainty in attributing changes in risk to external causes — in this schematic example, our 'best guess' is that cause A has increased the risk of this event by a factor of three, but there is still a 10% chance that it has not increased the risk at all. The lower axis shows the fraction of the new risk of this event that can be attributed to A — specifically, the amount by which current risk levels would be reduced if A were absent. If A has trebled the risk over its 'pre-industrial' level, then there is a sense in which A is 'to blame' for two-thirds of the current risk. To compute a single figure as a basis for compensation, one could simply average over all possibilities to give a 'mean likelihood-weighted liability', which in this case is somewhat less than two-thirds because of the uncertainty in how much the risk has increased (the spread of the distribution).

Would the concept of averaging over

possibilities, which is familiar enough in quantum mechanics, ever be acceptable to 12 honest citizens on a jury as a basis for a compensation settlement? This is not a scientific issue, but a legal one — the figure simply shows what science could, in principle, deliver. We are not yet in the position to produce such figures for the contribution of greenhouse-gas emissions to the increased risk of flooding in south Oxford (Fig. 2). But the point is, if we get the science right, we could be.

Who pays?

Figure 1 applies directly to damages related to changing risks rather than to actual events — essentially, the increased cost of insurance. But what about uninsured losses, or the losses incurred by the ultimate re-insurer of flood damage? We will never be able to say, at any confidence level, that human influence has contributed x% to an actual weather event. What we can say is that past greenhouse-gas emissions are likely (at some pre-specified confidence level) to have increased the risk of that event over its pre-industrial value. This does not preclude compensation settlements — juries have not been perturbed by the possibility that an individual smoker might in any event have contracted cancer. From a naive scientific perspective, however, what is the equitable solution?

Equal treatment of insured and uninsured losses suggests we should simply apportion liability according to the change in risk. If, at a given confidence level, past greenhouse-gas emissions have increased the risk of a flood tenfold, and that flood occurs, then we can attribute, at that confidence level, 90% of any damage to those past emissions. Again, we simply have to average over all possibilities consistent with current knowledge to arrive at a net likelihood-weighted liability. So, if courts can accept the concept of averaging over possibilities to produce an equitable distribution of liability, in theory, one day

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people driving up the local hill in their SUVs might be contributing to the cost of replacing the floors in Vicarage Road.

Some climate-change-related lawsuits have already been filed, but so far these have focused on technical legal issues, such as whether an adequate environmental assessment must cover climate change. The big question is whether current greenhouse-gas emitters could ever be held liable for the actual impacts of their emissions. The prospect of a class-action suit with up to six billion plaintiffs and an equal number of defendants may seem rather daunting, but if we can overcome these problems in end-to-end attribution, everything else is (at least conceptually) straightforward. Carbon dioxide is a well-mixed greenhouse gas, so an equitable settlement would apportion liability according to emissions, with some discounting over time to allow for the lifetimes of carbon dioxide anomalies in the atmosphere.

There are, of course, very substantial practical challenges in tracking down who has emitted what, but by the time we finish paying off our home loans in the early 2020s, almost two-thirds of greenhouse gases in the atmosphere will have been emitted post-1990 (the usual benchmark date at which climate change began to be considered a serious issue). So we could agree an amnesty for pre-1990 emissions without significantly affecting the final outcome, thereby avoiding the ethical dilemma of holding people liable for emissions made before climate change was on the agenda. There are also challenging issues about where liability lies — with a company for selling fuel, or with an individual for driving? Such problems are not unique to climate change. If I were to sell you deodorant contaminated with dioxins, you would be unimpressed by the defence that the chemicals were doing no harm to anyone while in the can. Does the same logic apply to fossil fuels?

Help from the hidden hand

Opponents of such a class-action suit would doubtless argue that the consumer always pays in the end, and any initiative in this direction would inevitably increase the cost of fossil-fuel-based products, damaging the economy, jobs and so forth. Crucially, however, the size of the 'climate-change risk premium' would be determined by the hidden hand of the market, not by politicians in tortuous intergovernmental negotiations. There would no longer be any need to forge a near-global consensus on the risks of climate change before we agree on what to do about it. A market would emerge in cover against climate-related law suits. Companies that genuinely subscribe to the optimistic view that any climate change will be small and benign could decline such cover, but in an efficient market, they would then pay a corresponding premium on their cost of long-term capital. Paying extra for fuel to cover the cost of the oil company's climate risk insurance might feel rather like a carbon tax, but there is no point in blockading roads over it.

Many of the possible losers from climate change, such as polar bears or the inhabitants of the Earth in 2200, would be unable to benefit from any class-action suit that had any bearing on decisions made now. Their only protection is our collective environmental conscience, presumably expressed through government intervention. We all care about polar bears, of course, but to judge from the current rate of progress in post-Kyoto negotiations, it appears that we are not thought to care that much. And even the most impassioned eco-warrior has nothing on a homeowner faced with negative equity. Politicians have many things to worry about, so perhaps it is time to consider some apolitical mechanisms for redistributing the costs of climate change. First, however, there is science to be done — the impression held by much of the scientific community that the attribution problem for climate change is largely done, apart from mopping-up operations. That is certainly not the view in south Oxford. ■

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Figure 2 **A duck's delight: widespread flooding in January caused misery in Oxford.**