7

MORE THAN SCIENCE

Up until this point, we have focused on the role of science in understanding the risks of climate change. I have argued that in many ways, science could be doing a better job of informing risk assessment. But while science is at the centre, it is not the whole story. The risk of climate change depends to a great extent on factors that are not for science to judge.

For a full picture, there at least two more questions that need to be addressed. First: what will we, humanity, do to the climate? And second: what, in the new climate of the future, might we do to each other?

GLOBAL EMISSIONS: WHAT WILL HUMANITY DO TO THE CLIMATE?

The risks of climate change depend overwhelmingly on the future pathway of global emissions. The more greenhouse gases we emit, the more the world will warm, and the more severe will be all the consequences discussed in earlier chapters.

Global emissions in future could go up, down, or stay the same. A wide range of pathways are possible. There are plenty of fossil fuels still in the ground: a good deal more oil and gas, vast unexploited coal deposits under Russia and Alaska, and even frozen methane under the ocean floor. If we keep on burning our way through whatever fossils we get our hands on, annual global emissions by the end of the century could be double or even triple what they are now. Alternatively, if we take every opportunity to cut emissions, capture carbon and stuff it underground, we could plausibly reach net zero global emissions by around the middle of this century, and even venture into net negative global emissions sometime after that.

https://doi.org/10.1017/9781009568470.007

Which pathway becomes the reality depends on how fast our population and our global economy grow, and how quickly we develop and deploy zero-emission technologies. Crucially, this last variable is a matter of choice. Not the choice of any one country, but the choices of many people in many countries.

These choices are fundamentally unpredictable. Consider the swinging pendulum of US politics on climate change. President Clinton's Democrats negotiated the Kyoto Protocol, but the Republicans in the Senate chose not to ratify it, and President Bush made no effort to implement it. President Obama did as much as he could to cut emissions by executive decree, avoiding the obstructionists in Congress. President Trump then came along and reversed all of Obama's policies. Then President Biden took charge and committed the US to achieving net zero emissions. Who knows what will happen next? How long will it take for the US political system to be reformed so that Republican party politicians can be honest with their voters and responsible towards their children, instead of living in fear of the vested interests that fund their election campaigns?

The US is an extreme example, but in all countries the politics of climate change moves forwards and backwards. If anyone is able to guess where things are going, it is not climate scientists. Financial analysts can see how much money is being poured into finding more fossils to burn, and how much is being reallocated to clean technologies. Technology analysts can track how fast those clean technologies are being developed and deployed in markets across the world. Political analysts can track opinion polls, governments' targets, policies, and political trends, and form some view of whether these are likely to push emissions up or down in the near future.

Taken together, these financial, technological, and political assessments can tell us something about the likely future pathway of global emissions. But only up to a point. The sheer unpredictability of future choices means that we have to recognise a high degree of uncertainty.

Unfortunately, this uncertainty is typically not well handled in the reports given to governments. Science assessments, such as those of the IPCC, usually include a range of high and low

https://doi.org/10.1017/9781009568470.007

scenarios for global emissions, without saying anything about their relative likelihood. This is fair enough, given the likelihood is not a question of science, but it is not very helpful for a risk assessment. Policy assessments often go to the opposite extreme, giving a single central projection for global emissions, along with a corresponding estimate for global temperature rise.

After countries set national emissions targets around the Paris Agreement in 2015, one analysis estimated that the most likely aggregate effect of these targets was an increase in global temperatures of 2.7°C by the end of the century.[1] This number was so widely repeated that it became accepted in the policy community as a truth: the Paris Agreement had put the world on course for 2.7°C of temperature rise. But how was this number arrived at? Most countries' targets only went as far as the year 2030. To predict a pathway for global emissions all the way to the end of the century, the analysts had to come up with a way of extrapolating 'current policies' for another seventy years. It should be obvious that there is no such thing as a 'current policy' for the year 2083 when most of the people who will be making policy at that time have not yet been born. The number was not much more than a random guess, but few people in government had the time to think about it or the interest to challenge it. However many times I tried to kill it, striking it out of briefing papers for ministers, the bloody thing kept coming back.

The risk is that communication of such central estimates for global emissions and consequent temperature rise, based as they must be on guesses about the future, leads to complacency. It is dangerous to assume that the long-term emissions targets that countries have announced will be met, or that progress in the coming years will be continued in future decades. Everyone involved in climate change knows that the world is 'off track' for meeting the internationally agreed targets for limiting global temperature rise. But far fewer people seem to have a good sense either of how low the chances are becoming of us meeting those goals, or how substantial the chances may still be of us running into much higher degrees of climate change.

With the appropriate analysis and communication, the risk of the world following a high-emissions pathway can be made

https://doi.org/10.1017/9781009568470.007

clear. Science can then be used to explain how the climate may respond. From this, we will be able to identify some direct risks to our interests, as discussed in earlier chapters. We will also be able to contemplate the outlines of a significantly changed future environment.

SYSTEMIC RISKS: IN A FUTURE CLIMATE, WHAT WILL WE DO TO EACH OTHER?

After the catastrophic terrorist attacks that felled the Twin Towers of the World Trade Center in New York on 11 September 2001, the US President and Congress created a National Commission on Terrorist Attacks Upon the United States, to understand how this event had happened, and how such a tragedy could be prevented from happening again.

When this '9/11 Commission', as it became known, published its findings, it concluded, '*We did not grasp the magnitude of a threat that had been gathering over time.*'[2] While there had been many failures – of policy, of management, and of capability, '*the most important failure was one of imagination*'.[3] Security analysts had simply not imagined that a group of extremists from one of the world's poorest countries, using relatively trivial financial resources, might hijack a large aeroplane and fly it into a building.

This finding was brought to my attention by the Military Advisory Board of the Center for Naval Analyses (CNA), a group of retired generals and admirals who study issues relevant to US national security and provide analysis to inform policymakers and the public. They warned that with climate change, we must guard against a similar failure of imagination. They urged governments to consider not only the simple, direct impacts of climate change, but also the risks that are more complex and systemic.[4]

These systemic risks exist because climate change affects almost everything. Its impacts on all elements of natural and human systems interact with each other, and from those interactions, new risks emerge. The outcome, in the worst case, can be the failure of those systems.

https://doi.org/10.1017/9781009568470.007

Already, we can see these systemic risks appearing. In the Arctic, where temperatures are rising twice as fast as the global average, the shrinking area of sea-ice, decline of animal populations, and unpredictable weather patterns are threatening the viability of Indigenous peoples' way of life, while the thawing permafrost threatens to destabilise buildings, roads, pipelines, and airports.[5] In megacities, climate and resource stresses can ripple out through infrastructure systems and across the economy. Sao Paulo's low rainfall and high temperatures in 2014 led to shortages of water affecting the functioning of schools, hospitals, and businesses; the impacts on agriculture and hydroelectric power led to higher prices for food and electricity; these contributed to social unrest in parts of the city; and all this led to economic losses of over $5 billion.[6]

In Syria, the extreme drought that hit the country between 2007 and 2011 is thought to have been made two to three times more likely by climate change.[7] The drought caused widespread crop failure and loss of livestock, contributing to the displacement of around two million farmers and herders, many of whom fled to cities already crowded with Iraqi and Palestinian refugees. By 2009, more than 800 thousand Syrians had lost their livelihoods as a result of the drought; by 2011, around a million were extremely food-insecure, and two to three million had been driven into extreme poverty.[8] While many other factors were important in driving the political unrest and conflict that followed, it is difficult to imagine that this widespread impoverishment and large-scale displacement did not play a role.

Climate change is also estimated to have made the extreme heat wave suffered by Russia in the summer of 2010 around three times more likely.[9] The heat wave contributed to drought and fire, and reduced Russia's wheat production that year by 30%. At the same time, droughts affected wheat production in China and Ukraine. Reduced production, protectionist measures, commodity speculation, and large-scale purchases on the global market all contributed to a more than doubling of the global wheat price in the second half of 2010. The top nine wheat-importing countries in the world, on a per capita basis, are all in the Middle East and North Africa. Seven of those are

https://doi.org/10.1017/9781009568470.007

developing countries and spend over a third of their average household income on food. All seven experienced political protests resulting in civilian deaths in 2011, with food price rises recognised in many of these countries as one of the contributing factors.[10]

The point is not to attribute all ills in the world to climate change. The point is that many of our systems are fragile, dysfunctional, or unstable already. Climate change puts them under greater stress, increasing the risk of system failure. So, how well are we doing at understanding these risks?

The UK's first national climate change risk assessment commissioned a study, almost as an afterthought, to look into the 'indirect' risks of climate change to the UK: those that arose not within our own borders but elsewhere in the world with the potential to affect our interests. Security risks, and disruption of global food systems, came within this category. The study reached a striking conclusion: the threats to the UK due to climate change impacts around the world could be an order of magnitude greater than those that affected us directly.[11] It reached this finding despite only considering a global temperature increase of 2°C – effectively a best-case scenario.

Understanding what the security risks of climate change might look like in a worst-case, or even a 'most likely' scenario, is difficult. The IPCC makes clear the limitations of academic study. At the very end of its chapter on 'human security', it writes:

> At high levels of warming, the rate of changes in environmental conditions in most places will be without any precedent in human history. Hence analysis concerning human security, in those circumstances of very high impacts, is uncertain. Much of the current literature on human security and climate change is informed by contemporary relationships and observation and hence is limited in analyzing the human security implications of rapid or severe climate change.[12]

In other words: we mostly study the past and present; the future will be completely different, so we have no idea.

The 9/11 Commission found that the US intelligence community had failed to recognise the risk posed by Al-Qaeda

https://doi.org/10.1017/9781009568470.007

because it was a radically new kind of terrorism, posing a threat beyond any the US had previously experienced. The Commission observed that 'Imagination is not a gift usually associated with bureaucracies' and concluded, 'It is therefore crucial to find a way of routinizing, even bureaucratizing, the exercise of imagination.'[13]

Ever since Japan's surprise attack on the US navy in Pearl Harbor in 1941, the US defence and intelligence community has devoted considerable effort to developing processes to exercise imagination in a structured way. These include scenario exercises, where possible future situations are imagined in detail so as to identify risks and test strategies; red teaming, where you put yourself in the shoes of your enemy and imagine what they might think and do; and war gaming, where a simulated encounter between adversaries provides insights into possible actions and outcomes.

One of the institutions that led these efforts was the Center for Naval Analyses (CNA). Founded in 1942 as the 'Antisubmarine Warfare Operations Research Group', it evolved through the decades, analysing the risks of nuclear weapons and guided missiles, guerrilla warfare in Vietnam, and strategic competition with the Soviet Union. In the post-Cold War era, it increasingly considered a wider range of risks including terrorism, humanitarian disasters, and environmental instability.[14]

I was introduced to the experts at the CNA by philanthropists at the Skoll Global Threats Fund, who were interested in whether these techniques could support a better understanding of the security risks of climate change. Together, we decided to see if we could address the gap left by the IPCC: to assess the security risks in a future that might be radically different from the present.

One way we did this was through a scenarios exercise. Climate scientists set out some parameters: what could happen to temperature, sea level, crop production, water resources, and so on, in a high-end climate change scenario, based on the academic literature. A diverse group of security experts – former intelligence bosses, army generals, navy admirals, diplomats, and analysts, from the US, Europe, China, and India – then talked to each other about what the security implications might be.

https://doi.org/10.1017/9781009568470.007

It is fair to say that the experts in the room were not full of optimism. Some of the basic parameters were worrying enough. Many countries in the Middle East are already highly water-stressed, and are expecting population increases of 50–100% over the next few decades, at the same time as climate change could cut renewable freshwater resources by anything from 10% to 50%. In Sub-Saharan Africa, more than a quarter of the population was undernourished in 2010–2012; many countries are expected to double their populations by mid-century, reducing arable land per capita to below the threshold of extreme stress, while climate change is expected to negatively affect the production of crops.[15]

The experts considered how countries would do their best to adapt to climate change, but also how many were struggling to adapt to the low level of change already experienced. They did not find it hard to imagine how things could get worse. At high degrees of climate change, the risks of food and water insecurity, social stresses caused by inequality and large-scale migration, the increasing expense and difficulty of protecting coastal cities, and the breakdown of infrastructure systems subject to multiple stresses, would all intermingle. There would be a growing risk of state failure, even in countries that are currently considered developed and stable.

As a second approach to structured use of the imagination, we organised what was later reported as 'probably the first global climate war game'.[16] The same group of international security experts played the roles of leaders of major countries and regions, taking decisions to advance their national economic and security interests in the context of a changing climate. One of the participants was Major General A. N. M. Muniruzzaman, from Bangladesh. He recounted his experience to a journalist afterwards: 'As climate scenarios became more and more difficult and complex, I would have expected people to be reaching out and being more inclusive. The countries' reactions were just the opposite: they became more inward-looking and insular.'[17] Competition for land, food, and water drove inequality, conflict, and migration. Some developed countries cut back international aid to concentrate on solving their own problems, while those

https://doi.org/10.1017/9781009568470.007

that persisted with an internationalist approach suffered an increasingly insupportable burden.

I will not describe the findings of these exercises at length, because my aim is not to convince you that they are correct. A scenarios exercise or a war game does not prove anything. Its value lies mainly in the insights it generates among its participants. You can form your own view by reading the science and thinking for yourself about the security implications. Any government can make its own assessment by putting its climate scientists and security chiefs in a room together and asking them the right kind of questions. The point is that without some attempt at structured use of the imagination, some of the largest risks of climate change are likely to remain unexplored. And to do this properly, we need experts in the systems whose failure would cause us the greatest concern. We cannot rely solely on the scientists.

https://doi.org/10.1017/9781009568470.007