# ADAPTATION

## THE RATIONAL CLIMATE POLICY


**Andrew Montford**


**With a foreword by Professor Michael Kelly FRS**


**The Global Warming Policy Foundation**
Report 53

**Adaptation: The Rational Climate Policy**

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Report 53, The Global Warming Policy Foundation



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## About the author

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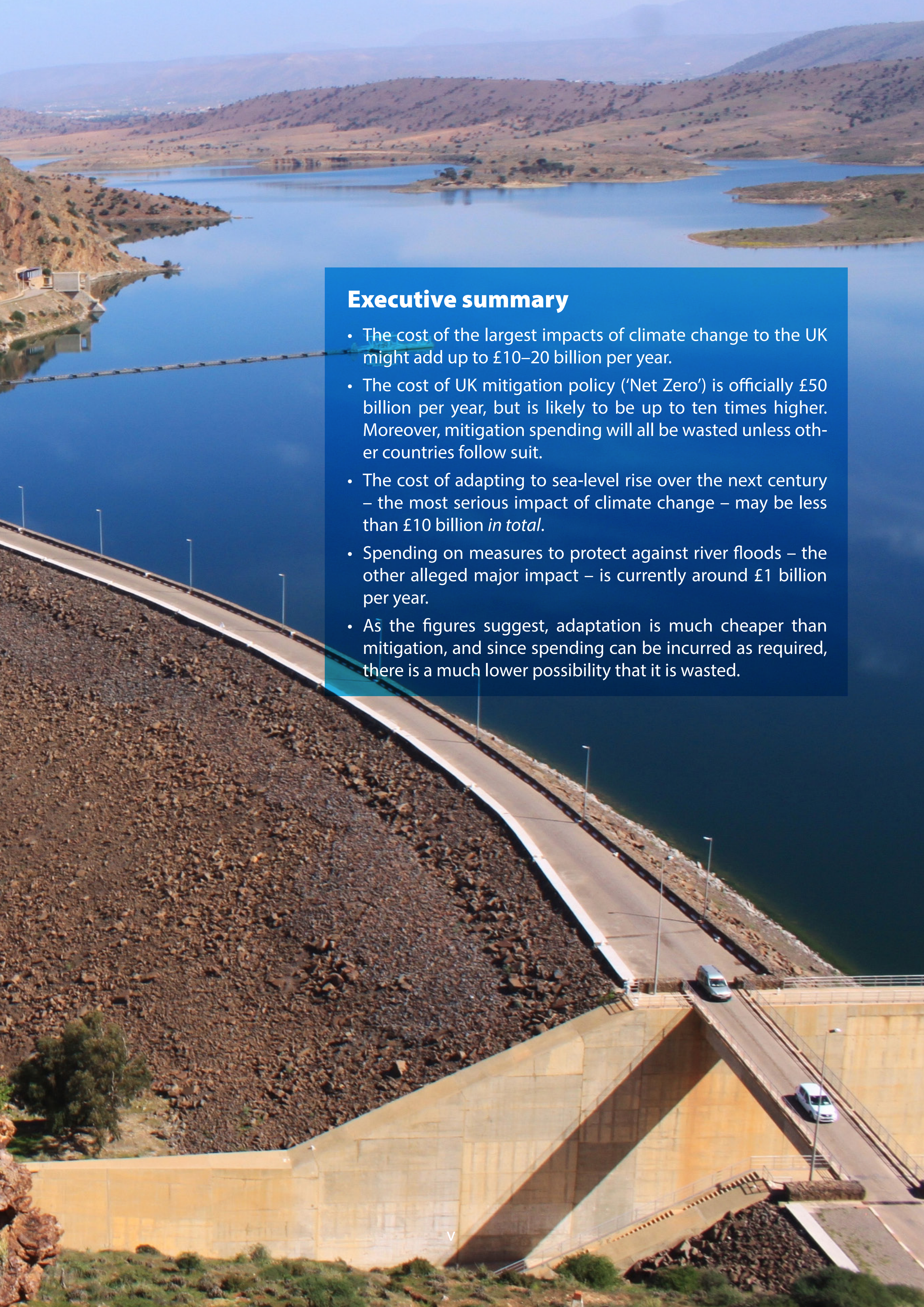


## Executive summary

- The cost of the largest impacts of climate change to the UK might add up to £10–20 billion per year.
- The cost of UK mitigation policy ('Net Zero') is officially £50 billion per year, but is likely to be up to ten times higher. Moreover, mitigation spending will all be wasted unless other countries follow suit.
- The cost of adapting to sea-level rise over the next century – the most serious impact of climate change – may be less than £10 billion *in total*.
- Spending on measures to protect against river floods – the other alleged major impact – is currently around £1 billion per year.
- As the figures suggest, adaptation is much cheaper than mitigation, and since spending can be incurred as required, there is a much lower possibility that it is wasted.

## Foreword by Professor Michael Kelly FRS

There is a major problem, across the whole world, with the current public discourse on action on climate change, as revealed in this incisive and comprehensive look at adapting to climate change by Andrew Montford. The paper reveals that although climate adaptation has been the norm for millennia, most of the world's spending is currently targeted at mitigation, despite it being 100 times worse in terms of value for money.

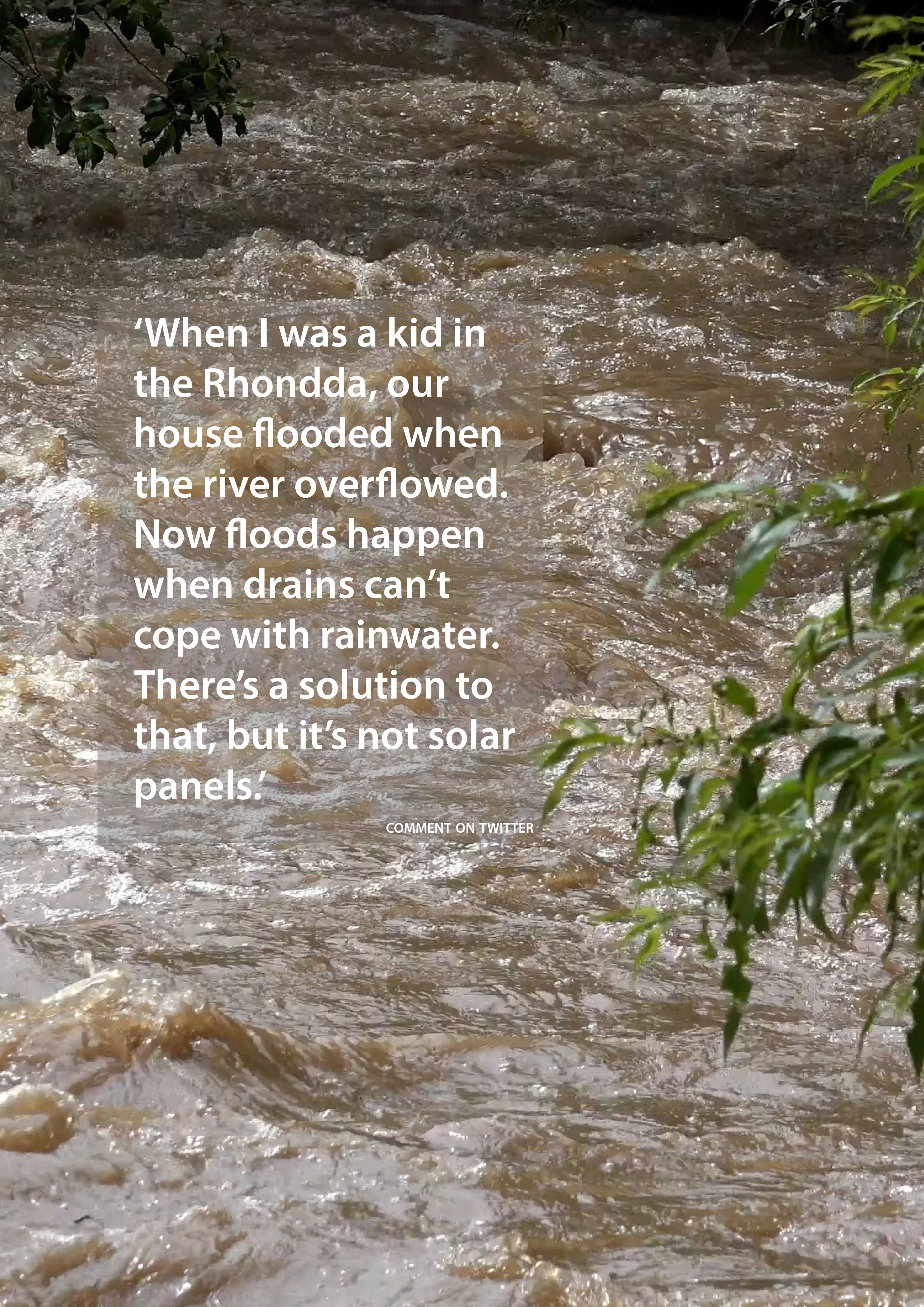
The origin of this problem lies squarely with the Intergovernmental Panel on Climate Change, the lack of project engineers and logistics experts on its Working Groups, and a lack of historical perspective throughout. Working Groups II and III, on Impacts and Mitigation respectively, are simply divorced from reality, making their recommendations irrelevant as a basis for practical projects. The global response to the recent Covid-19 pandemic shows a similar lack of engineering project and logistics expertise, and has similarly resulted in the formulation of foolish responses. Both debacles have parallels with the Old Testament generation, who decided to build a tower to heaven, not knowing how to define the end point of success and not knowing how much it would cost at the outset. Then, as now, they had to make do with blind faith. The failure of the Tower of Babel should be an object lesson to us all.

No science or impacts analysis has shown that we can prevent climate change, as there are natural forces well outside mankind's control that have far greater impact. They have driven climate change down the ages, and will continue to do so long into the future. No-one has any idea of how to measure the actual change to the climate consequent upon the investment in climate mitigation. This spending is an act of blind faith, akin to the foolishness of the tower builders at Babel. No one is prepared to discuss the actual opportunity costs of the vast expenditures being sought under the seemingly innocuous title of a 'net-zero' economy in 2050.

By contrast, the value-for-money arguments for climate adaptation measures are normally compelling. The Dutch have been adapting to sea-level rise for centuries, and Andrew points out the evidence of sea walls, since breached, that date back millennia. In developed countries subject to seismic activity, building codes become more stringent with time, as people try to use technological advances to reduce future earthquake risk.

The lesson from this analysis is the need for a UK equivalent of the Earthquake Commission in New Zealand. If everyone thinks they are at some risk from future climate change, to which they could adapt if and when necessary, a social fund for that purpose spreads the risk. Spending will only occur when necessary. The Thames Barrier was built in the 1980s when actuarial calculations indicated that it would save costs of flooding in London during its design life that were greater than the cost of building the barrier. Its height will be increased at a time again dictated by actuaries. The same should apply to flooding, changes in food production, and any other changes caused by the future climate.

As this paper makes abundantly clear, adaptation is the only rational policy option for climate change action today. It is my hope that the central thesis of this paper gets taken up into the debate of those with an influence on policy. The UK Climate Change Committee seems inoculated again the realities set out here, but my hope is that the politicians might have the decisive word.



‘When I was a kid in the Rhondda, our house flooded when the river overflowed. Now floods happen when drains can’t cope with rainwater. There’s a solution to that, but it’s not solar panels.’

COMMENT ON TWITTER

## 1. The false dichotomy

'Net zero expensive? You'll find that the cost of doing nothing is much higher'. This is a common argument made to justify the extraordinary costs and restrictions on human freedom that are currently being imposed on ordinary people in the developed world.

A moment's reflection reveals that it's a trick. There are, in reality, two ways in which people and societies might react to changes in the climate: to adapt to them, or to try to prevent them through mitigating measures. The idea that any rational person or any functioning society would simply stand back and let rising seas overtake them is absurd.

But climate policy in most rich countries is based around the idea that we have a choice between 'do nothing' and rolling back political and economic freedoms and reverting to a preindustrial lifestyle in order to change the weather a hundred years hence.

This paper looks at what is missing from this false dichotomy: the possibility of adaptation.

## 2. Adaptation is in our nature

In the waters off the Carmel coast, south of Haifa in Israel, storms and human activity have uncovered a series of neolithic settlements, long submerged beneath the waves. Through careful dating of the artifacts revealed, archaeologists have been able to trace the retreat of the settlements. The oldest of them, dating back nearly 10 millennia, is now 10 metres underwater and between 200 and 400 metres offshore.[1]

In those days, the seas were sometimes rising at up to 4 mm per year, rather faster than today, as a result of global temperature increases, as the Earth recovered from the last Ice Age. We can speculate that when the time came to rebuild them, homes close to the waters' edge would have been abandoned and replaced with new ones further up the slope. It is surely unlikely that their owners waited until the waves swamped them before taking any action.

So in some ways, this movement to higher ground represented an early example of simple, unfussy climate adaptation, and a refutation of the idea that 'do nothing' is a plausible possibility. However, it turns out that Neolithic man also had practical constructive measures that could be deployed. At the site known as Tel Hreiz, archaeologists have discovered a line of heavy boulders facing the sea – in other words, a 7000-year old sea wall.[2]

Adaptation to climate changes is, it seems therefore, part of human history. What is more, it may well be part of human nature: it has been conjectured that the key evolutionary developments that led to the emergence of *Homo sapiens* were the result of adaptation to climate change.[3]

It is unsurprising then that we see evidence of adaptation to climate change across our written history too. The environmental historian Dagomar Degroot has looked at the way Europeans coped with the Little Ice Age, the last great upheaval in our weather systems, and has found only unhysterical adaptation.[4] For example, as Greenland cooled, the Vikings developed irrigation systems to increase hay yields, and took a larger harvest of walrus to reduce reliance on agriculture. It was only increased sea ice, competition from the Inuit, and the decline of walrus ivory markets that finally led them to leave.

A few hundred years later, Dutch whalers responded to falling temperatures by shifting their processing stations from Spitzbergen to Amsterdam (a move that had the unexpected side effect of vastly improving the quality of their product). Shipwrights reinforced ships' hulls so that they could survive occasional collisions with ice. And despite the wild storms of the 17th century, which broke through the dykes, the Dutch were on a roll. They adapted fast to the changing weather patterns, developing skates to allow them to travel on the ice, and ice breakers to clear it from the harbours. With typical ingenuity, they then sold the ice to householders to preserve food and cool their drinks. Little surprise then that their trade flourished, and the population grew like topsy. The Little Ice Age was the golden era of the Dutch Republic.

So if our ancestors could adapt and thrive in the face of a changing climate, why can't we?

## 3. The effects of the weather, and how to adapt to them

In order to understand how we might adapt to global warming, we first need to understand what the major future impacts are alleged to be.

An analysis prepared for the UK's official Climate Change Risk Assessment suggests that the major impacts are water related – coastal, fluvial and surface flooding – with a substantial additional cost coming from heat-related mortality (Figure 1).[5] Although the list of impacts in the graph is apparently not comprehensive, it is supposed to cover the major ones. Nevertheless, the bill to be paid is suprisingly modest,. By 2080, with 2°C or warming, costs will have risen to around £13 billion per year. (The 4°C scenario is implausible and should be ignored.[6])

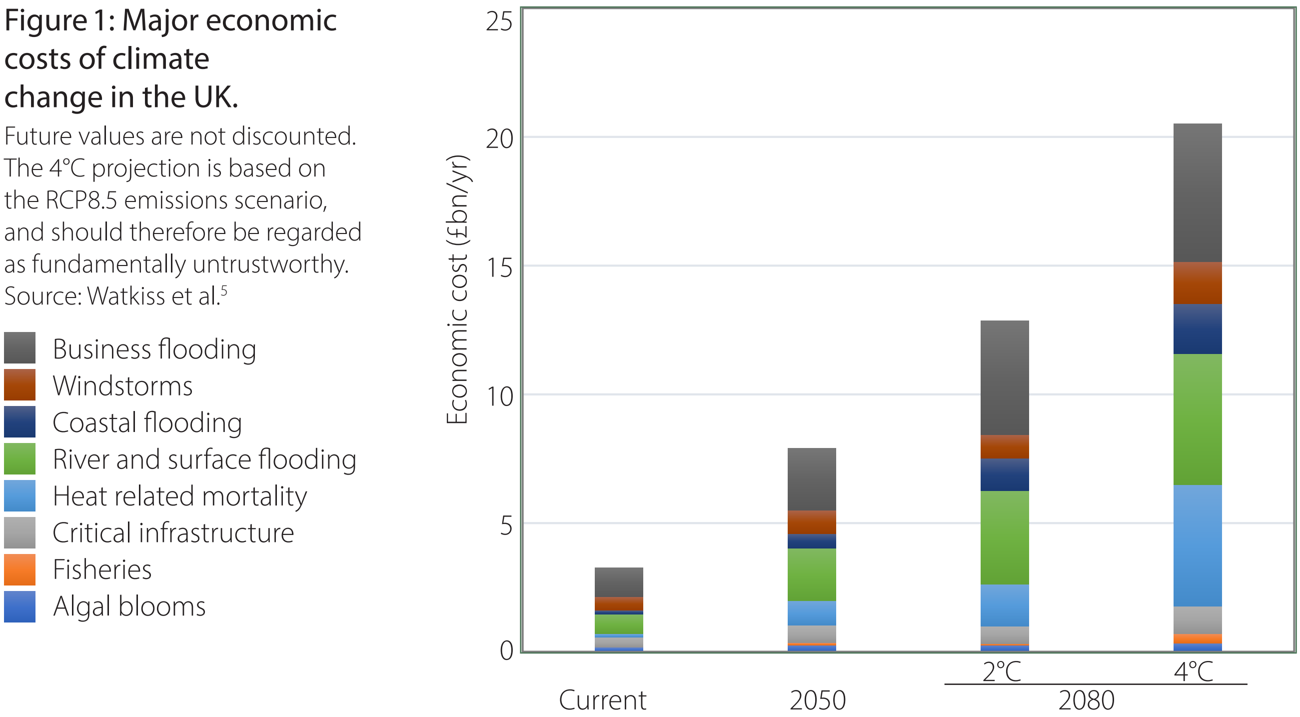
An analysis along the same lines for the USA tells a similar story.[7] With 1.5°C of warming, the vast majority of the damage –$80 billion per year – comes from sea-level rise, with most other elements less than a tenth of that value. The effect of rising seas is therefore a good place to start.

### Sea-level rise

It is worth noting that the amount of land lost to the waves is not simply a function of melting ice in Greenland and Antarctica. Siltation and reclamation are two effects that work in the opposite direction, increasing the overall area of land in the world. These factors are not insignificant either. In fact, a recent study of

Figure 1: Major economic costs of climate change in the UK.

Future values are not discounted. The 4°C projection is based on the RCP8.5 emissions scenario, and should therefore be regarded as fundamentally untrustworthy. Source: Watkiss et al.[5]




satellite imagery concluded that, since the 1980s, the Earth has gained more land in coastal areas than it has lost.[8] Nevertheless, climate scientists are insistent that rising seas represent an insurmountable future threat.

Estimates of the cost of damage from sea-level rise are often extraordinarily high, with one study suggesting a figure of $100 trillion per year, or 11% of global GDP.[9] Another paper suggested that by 2100 1.7 million square kilometres of land would have been lost and that 187 million people would have been displaced. It is easy to see why sea-level rise is so central to estimates of the cost of global warming.

However, as Bjørn Lomborg points out, it is only possible to reach numbers of this magnitude by assuming that modern man will ignore the example of his Neolithic ancestors, opting to let the waves overtake him; in other words, that no adaptation will take place.[10]

Put like this, the absurdity becomes clear. We have coped admirably with the sea-level changes of recent millennia, and even better with those of recent centuries.[11] Every year, it is becoming cheaper and easier to put adaptation measures in place. For example, the UK's official adviser on decarbonisation, the Climate Change Committee (CCC), has put a price tag on the shoreline management plan for England, which is supposed to deal with protecting all coasts out to the end of the century. The bill has been put at £6.4–£9.2 billion, in discounted terms.[12]

Importantly, the CCC notes that some of this expenditure would not be cost effective and would be unlikely to be funded. It says that over 1500 km of coastline would therefore have to be abandoned. However, it is noteworthy that the small print says that 'not cost effective' means a benefit-cost ratio of less than 2.5, and also that the benefits are defined only as properties saved

– in other words that not all the benefits are captured. Loss of farmland, for example, would not show up.

Moreover, the bill to be paid needs to be compared to the sums that the CCC intends us to spend on climate mitigation. Their estimate for delivering Net Zero carbon emissions is around £50 billion per year, every year until 2050, so a one-off bill of £10 billion to adapt away the largest impact looks like a very good deal indeed. What is worse, the CCC's figures have now been exposed as incorporating absurd optimism about the costs of key technologies,[13] as well as on other scores.[14] A more realistic figure would be of the order of hundreds of billions each year.[15] That being the case, raising the sea walls a little starts to look like a bargain of historic proportions.

This is not just true in the UK. A study from 2011 attempted to estimate the bill to protect the whole planet from sea-level rise by adaptation, and suggested that $48 billion each year – 0.008% of GDP – would almost entirely eliminate the problem.[16]

## Water management and the climate

If managing the changing oceans is not apparently an insurmountable problem, what about fresh water, which can affect humankind in many different ways?

While we can say something about averages – hourly, daily, seasonal or annual, say – it is entirely normal for precipitation totals to show huge variances around that average. In England and Wales, the average rainfall across the winter months was around 200 mm in the 1820s; a century later in the 1920s it was 40% higher.

Activists, including many scientists, like to argue that global warming will cause more droughts and floods. Dry places and summers will become dryer, they say, while wet places and winters will become wetter. For example, relying on its computer models, the UK Met Office projects that global warming will bring about a fall in average precipitation of up to 47% in summer, and an increase of up to 35% in winter.[17] But knowing what we do about the natural variation in rainfall, we can wonder whether changes of the kind the Met Office models project are not actually just the kind of thing that mankind has been adapting to for millennia. We can also note that summer rainfall already varies from 400 mm in a wet year to less than 100 mm in a dry one. And finally we can note that the last 50 years of global warming has produced *almost no change in summer rainfall at all*.[18]

Of course, it might be argued that continuing with our existing engineering approach will leave us vulnerable to potentially large changes caused by AGW. There is, however, little empirical evidence to support the idea that the hydrological cycle will worsen under global warming.[19] Worse – climate models have little or no ability to predict how a changed climate will affect water resources in the first place,[20] and – despite the claims of activists – the kinds of changes predicted by global climate models (GCMs) are much smaller than the type of changes that would be predicted from the natural variation of rainfall and river flows,[21] and smaller than the other influences on water balance – notably population changes. In other words, using GCMs will tend to lull us into a false sense of security by leading us to ignore natural volatility!

Whatever the changes in water supply and demand the future brings, we already have the technologies to cope, developed over millennia. Like managing the rising seas, coping with floods and droughts is part of human evolution, and part of the story of the rise and fall of civilisations. As one paper pointed out, functioning societies deploy technologies and otherwise adapt to such changes, while failing ones build temples and make sacrifices to the gods.[22] In this anthropologically informed view, wind turbines and solar panels are simply temples to Gaia.

### *Coping with water shortages*

We have been building reservoirs for a long time. The Jawa dam in Jordan dates back 5000 years, and there are smaller dams nearby that may predate it by several thousand years.[23] The mountain fortress of Masada in Israel, next to the Dead Sea, was furnished with huge rainfall catchment chambers and rills to sustain the defenders under siege. Water can also be directed to aquifers rather than stored on the surface, a process known as managed aquifer recharge. This approach also has a long history, with prototypes going back to the Warring States period in China (475–c.221 BC). It is nowadays common across the world, including in developing countries.[24]

We have been piping in water in great volume to centres of population across great distances for almost as long as we have been storing it. Aqueducts are known to have been used by the Babylonians, Assyrians, Egyptians, Greeks, Romans and Byzantines, as well as the Nazca of Peru. It is nowadays entirely commonplace for cities in water-scarce areas to bring in water from far afield. For example, Athens, in the dry eastern part of Greece, brings in water from over 200 km away. While it is unlikely that London would ever need to bring in supplies from such a distance, it is clearly technically straightforward to do so, and a distance of 200 km would take in many areas of plentiful rainfall, such as the Welsh valleys.

Clearly then, we have had the technology to cope with inadequate water supply for a long time. If global warming were to bring more droughts, it will simply be a matter of deploying them more widely or on a larger scale. And if, occasionally, the water shortage is particularly severe, we know that societies tend to be willing to reduce consumption. During the seven-year drought that hit Athens in the 1980s, it proved possible to reduce water consumption by a third.[25] The author of this paper recalls his parents watering plants with bath water during the drought year of 1976.

### *Coping with excess water*

River floods – fluvial flooding in the jargon – result primarily from heavy rainfall on ground that is frozen, already saturated, or otherwise impermeable. Clearly, the recent trend towards milder winters in the UK[26] will make frozen ground less common, and therefore subsequent rainfall is less likely to lead to flooding. However, there is a perception that river floods are becoming more common. Much of this concern results from past decisions to build on floodplains, and the trends towards urbanisation and covering front gardens with hard surfaces, which cause rapid run-off of rainwater. In other countries, deforestation and resulting soil erosion may also play an important role.

It bears repetition: in climatological terms there is *little sign of intensification of the hydrological cycle on a global scale*.[27] Some authors claim to have found a small increase in the UK, but only in winter, and not in all regions.[28] Others have found increases in peak river flows, but have found it almost impossible to state whether these are anything other than natural variability.[29]

Meanwhile, the impact of river flooding – both in terms of mortality and financial losses – has been in decline, driven by greater wealth,[30,31] which funds the ability to put in place flood prevention measures: think of the Rhine Management schemes and the Dutch Delta projects. These can be hard measures, such as dams, levees and bunds, or soft measures, such as early warning systems.

Like sea defences, hard river defences have a long history. The Chinese were trying to protect themselves against the flooding of the Yellow River 3000 years ago, although their early efforts may have been less than a success, with silt accumulation behind the ever-rising levees eventually causing the whole river to divert course, with catastrophic consequences for those who found themselves in its new path. Closer to home, the medieval flood defences at Botolph's Bridge, near West Hythe in Kent, can still be seen,[32] as can the stone-sided dams built to defend Byland Abbey against flash flooding.[33]

Nowadays, a wide variety of measures is deployed to prevent river flooding. Dredging of silt from riverbeds to increase the carrying capacity is a process that needs little introduction, and the issues with resilting and therefore the need to redredge are also widely recognised. Permanent flood defence measures can of course be installed, but with the advent of sophisticated early warning systems,[34] temporary flood barriers can now be deployed when flood waters threaten. Another approach that is being tried is the building of tiny dams, high up a river's catchment, aiming to slow down the passage of water to flood-prone areas lower down. However, their efficacy is questionable, particularly in larger catchments.[35]

It is again revealing to compare the cost of these adaptation measures to the bill for decarbonising the economy: perhaps £200 billion per year for 30 years. The March 2020 budget for works to prevent river flooding in England allocated £1 billion per year for five years, with an average spend per scheme around £1 million.[36,37] Even if work at this level needed to be sustained for 30 years as well (which is far from clear – we have a limited number of towns that might flood), the cost is a drop in the ocean compared to what is required for mitigation.

## Storms and high winds

Storms are a normal part of life, and communities have always adapted to them. French historians Emmanuelle Athimon and Mohamed Maanan, in a study of life on the French Atlantic coast, note that they are a constant and *unpredictable* threat for coastal communities.[38] But they too found undemonstrative adaptation among villagers, who responded to increased storm activity during the Little Ice Age by building dykes in succession further and further away from dry land, so that the seas were met by a series of defences. Likewise, as ever, the Dutch, whose water dykes are backed up by so-called 'sleeper' dykes, and sometimes by a third line of defence, known as 'dreamer' dykes.

There is little evidence that storms are becoming worse across the globe.[39,40] The story is the same in the UK, where the official position is that there have been 'no compelling trends in storminess...over the last five decades'.[41] Yet despite fifty years of global warming having produced no discernible changes in wind speeds, climate modellers remain insistent that carbon dioxide emissions will cause things to get worse.

Yet whatever the truth of the matter, there is no doubt that our ability to 'adapt away' the problems caused by major storms is growing quickly: early warning systems, better quality buildings, widespread availability of hurricane shelters and so on mean that major storms tend not to be the disasters they were in the past. Consider hurricane impacts in Bangladesh, often mentioned asbeing particularly threatened by climate change. In 1970, the Bhola cyclone hit the low-lying country with sustained wind speeds of 185 km/h, and the resulting storm surge caused the deaths of half a million people. But as always, mankind did not stand still. Lessons were learned and adaptation measures began to be taken. That meant that in 1991, when another hurricane hit the country, this time with wind speeds of 235 km/h, the death toll was down to 138,000; still appalling, but far below the carnage of 1970. And so it continued. Cyclone Sidr, which arrived in 2007, had wind speeds of 215 km/h, but killed only 3400; Cyclone Amphan, in 2020, with wind speeds of 240 km/h, killed only 26.[42] This is not to suggest that the problem of hurricanes is in the past – 2020's Storm Eta killed 150 in Guatemala, when a mudslide swamped a village[43] – but a global trend of adaptation towards fewer fatalities and less damage is clear.[44]

Early warning systems, the ability to evacuate populations, and widespread availability of hurricane shelters have clearly had a transformative effect, but Bangladesh has also reduced other impacts of hurricanes. By 2015, around half of the land in vulnerable coastal areas had been poldered - in other words protected by sea walls.[45] Despite having been hit by Storm Amphan that year, in 2020 Bangladesh moved ahead of Indonesia to become the third largest rice producer in the world,[46] its output barely dented by the hurricane.

A lack of fresh water in the aftermath of a hurricane has traditionally been a big killer. But that is no longer the case now that modern transportation systems can bring in bottled supplies. Trucking in water is therefore an example of adaptation eliminating a disastrous impact of a hurricane, although leaving the society affected with major inconvenience and a substantial bill. Attention is now turning to ways to develop hurricane-resistant water systems, using measures ranging from simple raising of the polders, to storing water above likely flood levels, to tapping into aquifers.[47] If successful, the impact of a hurricane will be smaller still.

While there is a cost to these measures, they are undoubtedly and demonstrably less than the cost of doing nothing and orders of magnitude better than trying to mitigate by meddling with climate systems which we are barely beginning to understand. Again it is illuminating to consider the amounts that it is proposed the world should spend on climate mitigation measures. As one study found, a pound spent on adaptation to storms is anything between 5 and 22 times as effective as one spent on decarbonisation.[48]

## Deaths from extreme temperatures

Increasing temperatures directly affect human beings us in two ways: hot days become riskier, but cold days become less risky. Thus the direct effect of temperature change is necessarily a balance.

The Intergovernmental Panel on Climate Change states that 'is virtually certain that hot extremes (including heatwaves) have become more frequent and more intense across most land regions since the 1950s'.[49] Observations along these lines have been picked up by, for example, the *Lancet Countdown* report on climate and health, which notes that 'From 1990 to 2018, populations in every region have become more vulnerable to heat and heatwaves'.[50]

Perhaps not unexpectedly, the IPCC also notes that 'cold extremes (including cold waves) have become less frequent and less severe'. But it is now well established that cold kills far more people than heat.[51] Indeed, and counterintuitively, there is evidence that temperatures moderately different from normal are more of a problem than extreme temperatures. As an important recent paper on the subject put it:

> Cold was responsible for a higher proportion of deaths than was heat, while moderate hot and cold temperatures represented most of the total health burden.[52]

But the inescapable fact is that human beings live successfully in a wide variety of temperatures – from the cold of the Arctic Circle to the deserts of Arabia. It is therefore unsurprising that we find that rapid deployment of technology has effectively 'adapted away' the risks associated with high temperatures already. The *Moscow Times* reported that the 2010 heatwave in Russia caused a run on air conditioners,[53] which dramatically reduce the risk of death from heatwaves – by 90% or more.

Another step that might be taken is to change building designs to make them cooler in summer. The small windows and thick walls that are common in Spain might find their way to southern France for example. Israeli architects have pioneered highly effective natural circulation cooling of buildings. Passive air conditioning has a much older history than many might suspect. The Amber Fort near Jaipur in Rajasthan featured a water-moderated cooling curtain of silk theads suspended from a pierced copper water pipe drip-fed from a supply tank topped by servants. Breezes blowing through the curtain were cooled to the benefit of the princesses seated within. It is perhaps worth noting that there is a balance to be struck between what is required to reduce the impact of summer heat and what is needed in winter: plans to dramatically raise insulation standards on UK homes to reduce fossil fuel use risk making homes unliveable in summer as well as risking health conditions spread by lack of natural ventilation. If such ill thought through measures are imposed, we will face the incongruous need to take on adaptation measures to counter the effects of the mitigation measures we have mandated. What is the sense in that?

There appears to be no global time series for heat-related mortality, but we can see in the data from individual countries that the era of anxiety about global warming has seen mankind apparently adapting faster than the weather can change. For example, a study in Spain found a statistically significant reduction in heat-related death in the last decade, attributing the change to adaptation.[54] The IHME database, which gives figures for mortality from exposure to extreme temperatures (both hot and cold), finds that this is a diminishing problem, with a reduction of nearly 30% since the start of the century.

The evidence thus seems clear. To the extent that temperature changes represent a risk, we are quickly adapting it into insignificance.

## The food supply in a changing climate

Claims that climate change will bring about a dramatic reduction in the food supply also find little support in the data at present. Global food production has grown steadily over the 50 years of concerns about global warming, in every continent. This is not to suggest that the global temperature hasn't changed; it is simply to say that we have adapted away the impacts of climate change on food production, be that hot or cold temperatures, wet or dry or stormy weather, or climate-related plant diseases. Indeed, so good are we at coping with anything the weather throws at us that the amount of land required to feed the Earth's still growing population is almost unchanged in recent years. Were it not for the demand from biofuels, we could be returning land to nature on a grand scale.

Farmers are naturally adaptive, and will shift to different crops and technologies as economic circumstances (including the climate) change.[55] This is as true in the developing world as it is in the West.[56] The kinds of measures that are already deployed around the Mediterranean show what can be done to counter hot, dry weather (as just one example).

One of the best-known technologies is drip irrigation, which is known from sites predating the fall of the Temple of Solomon, but has become justly famous since Israeli scientists modernised and deployed it in the Negev Desert in the 1960s. Similarly, Israel has been a pioneer of recycling waste water into irrigation schemes. This means that dry weather need no longer bring disaster, in the way that it used to. In other Mediterranean countries, using nets to shade orchards and so reduce temperatures, has raised the quality and quantity of the fruit beneath.[57][58] And even livestock farmers have demonstrated a remarkable ability to reduce water use.[59] In other words, we have ways of coping with hot weather too.

These are relatively simple approaches to adaptation, but with the appliance of more advanced technologies, the possibilities expand still further. Gene editing enables us to develop new crop varieties in very short order, so farmers can already buy drought-resistance off the shelf.[60] Heat-resistance will be available soon.[61,62]

And this is not the end of the story. Instead of deploying new crop varieties, farmers could change crops completely. Once more this is nothing new. It is something they do all the time anyway, as they attempt to prosper while markets change in response to public tastes, political decisions, as well as the ever-changing weather. So, in a warming phase, we might imagine that grapes or olives would be grown in the English Midlands. This could in no way be seen as a disaster. Those of a pessimistic disposition might suggest that we'd lose land at the fringes of the Sahara, say, but this of course would be compensated by new agricultural land becoming available in the currently frozen north of Canada and Russia. The gains here would far outweigh the losses, simply because there is more land at high latitudes than there is at low ones. Moreover, pessimism about the effects of higher temperatures on the Sahara are probably unwarranted anyway. Higher temperatures there are likely to bring higher rainfall, and we can observe that what is now desert was forest and grassland during the Holocene climate optimum, when it was much hotter than today.

## Climate-related disease

Any discussion of climate-related disease has to consider the extraordinary collapse of mortality in these conditions. This trend began in the developed world two centuries ago, as an example set out in a recent GWPF paper reveals:[63]

> US death rates from dysentery, typhoid, paratyphoid, other gastrointestinal disease, and malaria – all water-related diseases, and which are therefore, almost by definition, climate-sensitive – to decline by 99–100% between 1900 and 1970.

This astonishing success is now repeating itself in the developing world, with climate-related disease haven fallen by around 50% in the last 30 years alone.

The extraordinary collapse of climate-related disease is not a specific response to climate change, but instead is simply mitigation of, above all, bacterial disease by the application of public health measures, such as clean water and refuse management systems. Simple domestic procedures, such as the use of insecticide-treated mosquito nets, have also been important. And finally, we have developed new drugs to help us with the rest – the recent announcement of the first malaria vaccine means that by far the most important remaining climate-related disease will become a diminishing threat in the future.[64]

So we find that climate-related disease, like so many other alleged threats of global warming, has to a large extent been 'adapted away' already; and that there is strong evidence that this trend will continue into the future. Spending hundreds of billions of pounds to mitigate a threat that is rapidly disappearing makes no sense whatsoever at any level, except, regrettably, as uninformed 'virtue signalling'.

## 4. Good reasons for adaptation

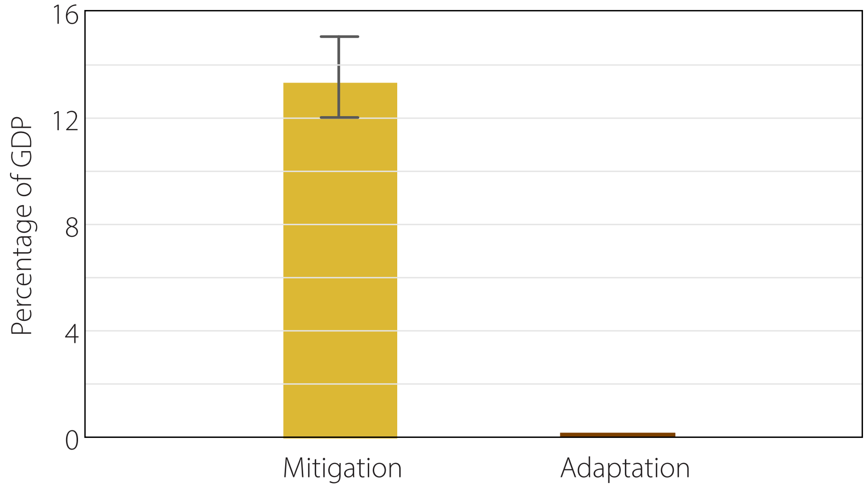
When comparing adaptation to mitigation, one quickly notices how much smaller the sums of money involved are. In 2007, the UN Frameword Convention on Climate Change put the investment cost of adaptation at over $100 billion per year by 2030, split approximately equally between the developed and developing worlds. This was similar to other estimates at the time.[65] Even if the cost burden were to be borne by the developed world alone, that figure amounted to less than $100 per head per annum. Similar estimates have followed since that time. In 2010, the World Bank put the cost at 0.17% of GDP annually (up to $100 billion per year).[66] The UN Environment Programme currently thinks the costs will rise to $500 billion in 2050, which is still only 0.17% of GDP.[67]

Compare these figures to those published for mitigating global warming. The UK's Climate Change Committee (CCC) has said that delivering 'Net Zero' will set the country back around 1–2% of GDP – around £50 billion – each year. But it is now known that their estimates rely on wildly optimistic input assumptions. For example, they assume that the current cost of electric vehicles is around half of what it actually is, and that the cost of electricity from offshore windfarms will fall by more than

50% by 2050. Using more realistic values suggests that a figure 2–3 times higher represents a lower bound on the bill to be paid. A recent paper by the consultancy McKinsey implies we should be thinking of costs an order of magnitude higher than the CCC suggests.[68] The contrast with the costs of adaptation could hardly be more stark (Figure 2). Either way, the UK alone would expect to spend more on mitigating projected (ie not certain) global warming *than it would take the whole world to adapt to it*. Decarbonising the UK economy therefore looks rather poor value for money.[69] Indeed, it appears to be worse than doing nothing – as shown in Figure 1, the cost of doing nothing, and allowing warming to rise to 4°C above preindustrial levels, is apparently only £25 billion per year.

Figure 2: Relative costs of mitigation and adaptation

Source: Mitigation, per McKinsey,[68] Adaptation per World Bank.[66]




Mitigation also has the problem that it addresses hypothetical changes in the far-distant future – the 'projections' of global climate models, in other words. Any spending is therefore predicated on the assumption that the models are correct (and in the words of the old saw, 'all models are wrong') about the effects of carbon dioxide emissions – on temperatures, and then on the other impacts, such as rainfall and sea levels – in the distant future. Mitigation spending therefore involves an extraordinary leap of faith: a fervent prayer that the models are correct and that the money will not go to waste. Given the time lags involved, that will not be known for a long time. That's because, while reduced carbon dioxide emissions might eventually affect the climate, there is widespread agreement among mainstream scientists that it will not do so for decades. So we may wake up in 2050 and discover that we have been spending trillions of pounds to no useful purpose.

In contrast, adaptation spending addresses real and immediate threats of *actual* changes in the world directly. As waves start to overtop a sea wall from time to time, those affected can start to consider raising it a little higher and, as the over-toppings become more frequent, they can decide to take concrete action - literal and metaphorical. If rivers flow a little higher, levees, bunds and polders can go up a little further in response. If they flow a lot higher, then we can respond proportionally. Climate models are irrelevant, because whether the changes observed are due to carbon dioxide emissions or not is irrelevant. Adaptation is simply the tried, tested, and proven way we have always done things.

The fact that adaptation spending is local and responds to real, observed threats rather than global ones that might or might not impact us in several decades' time also makes it a much easier sell for politicians. They can try arguing that people should go vegan – or forgo a car, or pay through the nose for their heating – in order to change the weather in 2050, but as the bills hit home, they are unlikely to find this convinces many voters on doorsteps. Adaptation spending, on the other hand, will rarely be objectionable to the electorate.

Mitigation preoccupation risks distracting political attention and public resources away from real, pressing problems. This possibility has been understood for a long time. As Pielke Jr and colleagues pointed out:

> In the Philippines, policymakers have begun to acknowledge the flood threats posed by the gradual sea-level rise of 1 to 3 millimetres per year, projected to occur with climate change. At the same time, they remain oblivious to, or ignore, the main reason for increasing flood risk: excessive groundwater extraction, which is lowering the land surface by several centimetres to more than a decimetre per year.[70]

Similarly, the Finnish public health expert, Mikko Paunio has set out how a focus on preventing the developing world from developing fossil-fuel power stations has become a major barrier to efforts to improve air quality.[71]

## 5. Conclusion

As I write, the UK is in the midst of a cost of living crisis, with a key driver being high energy prices directly resulting from policies designed to put this country at the forefront of mitigation efforts: strangling the nascent onshore gas industry, subsidising windfarms, and so on.

Meanwhile, climate scientists are struggling to work out why their computer simulations give implausibly hot estimates of future temperatures. Yet they still insist that we must heed their warnings of future catastrophes, and demand that we mitigate our way to a stable climate.

As we respond with policy fiasco after policy fiasco, the snow that blows past my window as I write reminds us that the climate changes all the time. It's what climates do. And that the more it changes, the more it stays the same. No matter how many trillions we spend, the challenge of dealing with whatever the climate throws at us from year to year will remain a pressing one and will have to be paid for.

For two decades, mitigation has been ascendant. It has led us to the ecological and economic illiteracy of Net Zero, and to the energy crisis in which we find ourselves today. Now it is time for a change of direction, and a focus on adaptation. That would be in tune with human history and also with a public that is rightly suspicious of the path we have taken.

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