



# 1.5°C – DEAD OR ALIVE?

THE RISKS TO TRANSFORMATIONAL  
CHANGE FROM REACHING  
AND BREACHING THE PARIS  
AGREEMENT GOAL

**Laurie Laybourn,  
Henry Throp and  
Suzannah Sherman**

February 2023

Cohort  
2040

## ABOUT CHATHAM HOUSE

**Chatham House, the Royal Institute of International Affairs**, is an independent policy institute based in London. Our mission is to help build a sustainably secure, prosperous and just world. Chatham House does not express opinions of its own. The opinions expressed in this publication are the responsibility of the authors.

## ABOUT IPPR

**IPPR, the Institute for Public Policy Research**, is the UK's leading progressive think tank. We are an independent charitable organisation with our main offices in London. IPPR North, IPPR's dedicated think tank for the North of England, operates out of offices in Manchester and Newcastle, and IPPR Scotland, our dedicated think tank for Scotland, is based in Edinburgh.

Our purpose is to conduct and promote research into, and the education of the public in, the economic, social and political sciences, science and technology, the voluntary sector and social enterprise, public services, and industry and commerce.

IPPR  
14 Buckingham Street  
London  
WC2N 6DF  
T: +44 (0)20 7470 6100  
E: [info@ippr.org](mailto:info@ippr.org)  
[www.ippr.org](http://www.ippr.org)  
Registered charity no: 800065 (England and Wales),  
SC046557 (Scotland)

This paper was first published in February 2023. © IPPR 2023

The contents and opinions expressed in this paper are those of the authors only.

The progressive policy think tank



# CONTENTS

<b>Summary</b> .....	<b>5</b>
<b>1. Introduction</b> .....	<b>7</b>
<b>2. Transformational change is needed</b> .....	<b>8</b>
2.1. As 1.5°C gets closer, the risks increase.....	9
2.2. Meeting global goals requires transformational change .....	10
<b>3. Questioning the viability of the 1.5°C goal impacts prospects for transformation</b> .....	<b>12</b>
3.1. The possibilities for 1.5°C are complex .....	12
3.2. Stories about 1.5°C matter .....	14
<b>4. The general case: the deepening crisis presents threats and opportunities for change</b> .....	<b>16</b>
<b>5. Responding to strategic risk</b> .....	<b>19</b>
5.1. Politics .....	19
5.2. Policy .....	20
5.3. Analysis.....	20
<b>6. Conclusion: We need to talk about strategic risk</b> .....	<b>21</b>
<b>References</b> .....	<b>22</b>

## ABOUT THIS PAPER

This paper is an output of the Cohort 2040 project, in collaboration with IPPR and Chatham House. This project seeks to better understand how the millennial and younger generations can provide the effective and transformational leadership needed to secure a better world even as environmental destabilisation grows.

The consequences of the worsening climate and ecological crisis could present threats and opportunities to the ability of societies to become more sustainable, equitable, and resilient. This paper explores one example of this dynamic: how the growing chance of breaching the Paris Agreement goal of 1.5°C is being used to justify slower action.

These dynamics could become an increasingly important factor affecting the careers and lives of younger generations. The Cohort 2040 project is exploring how to support these generations to better respond.

You can learn more about Cohort 2040 by visiting <https://www.cohort2040.org>.

This paper meets IPPR's educational objectives by reviewing the growing challenge for future leaders resulting from environmental harm. It also supports our objectives on advancing environmental protection and improving sustainable development by exploring options for improved preparation of future leaders to better promote these ends under worsening conditions.

## ABOUT THE AUTHORS

**Laurie Laybourn** is an associate fellow at IPPR, a visiting fellow at the Chatham House Sustainability Accelerator, and leads the Cohort 2040 project.

**Henry Throp** is a research analyst at the Chatham House Sustainability Accelerator.

**Suzannah Sherman** is a research associate at the Chatham House Sustainability Accelerator.

## ACKNOWLEDGEMENTS

The authors would like to thank James Dyke, Joseph Evans, Antony Froggatt, Nina Gillespie, Stephanie Gounaris-Shannon, Luke Murphy, Daniel Quiggin, Lesley Rankin, and Ana Yang. Particular thanks go to the V. Kann Rasmussen Foundation, whose support made this paper possible.

---

### Download

This document is available to download as a free PDF and in other formats at:  
<http://www.ippr.org/research/publications/1-5c-dead-or-alive>

### Citation

If you are using this document in your own writing, our preferred citation is:  
Laybourn L, Throp H and Sherman S (2018) *1.5°C – dead or alive?: The risks to transformational change from reaching and breaching the Paris Agreement goal*, IPPR and Chatham House. <http://www.ippr.org/research/publications/1-5c-dead-or-alive>

### Permission to share

This document is published under a creative commons licence:  
Attribution-NonCommercial-NoDerivs 2.0 UK  
<http://creativecommons.org/licenses/by-nc-nd/2.0/uk/>  
For commercial use, please contact [info@ippr.org](mailto:info@ippr.org)



# SUMMARY

The historical failure to sufficiently tackle the climate and ecological crisis could create consequences that challenge the ability of societies to tackle the root causes of this crisis. The vast changes needed to limit global heating and restore nature must be achieved in ever shorter periods of time. Continued investments in fossil fuels create more vested interests who oppose change. Meanwhile, societies are being called upon to respond to the relentless, damaging symptoms of the crisis. These challenges could increasingly distract from efforts to realise rapid decarbonisation and nature restoration.

This is a doom loop: the consequences of the crisis and the failure to address it draw focus and resources from tackling its causes, leading to higher temperatures and ecological loss, which then create more severe consequences, diverting even more attention and resources, and so on. We describe this as a ‘strategic risk’ to our collective ability to realise a transformation of societies that ultimately avoids catastrophic climate and ecological change.

This dangerous dynamic extends to how prospects for tackling the climate and ecological crisis are framed. We explore a key example: the growing debate over whether it is now inevitable that global heating will breach the internationally agreed goal of 1.5°C. The UN has concluded that this is not the case and limiting heating to 1.5°C is still possible with a “rapid and systemic transformation” of societies globally. Those arguing that 1.5°C is irredeemably lost are therefore making a judgement that vast social and economic changes cannot be made quickly enough or at all – at least within the status quo – or they do not wish to see such changes. They are also making judgements about how societies might manage the consequences of higher temperatures, including complex, cascading shocks and the growing chance of triggering dangerous environmental tipping points. These consequences are severe and should underline the need to seek transformations that secure the 1.5°C goal.

It is understandable that cynicism is growing over the possibilities of meeting the 1.5°C goal. Global emissions reached an all-time high in 2022. Climate policy is still predominantly focused on delivering incremental sector-by-sector change, which has proven inadequate. Vested interests and power imbalances are holding back action.

Narratives where it is assumed 1.5°C is lost have a political impact on what happens next, potentially encouraging or discouraging action to realise transformational change. The shock of thinking the goal is lost might, for instance, inspire greater pressure on leaders to deliver deep changes. Alternatively, it could be viewed as proof that such change is unrealistic or even undesirable. In general, the growing chance of breaching 1.5°C and the challenges of realising transformational change can be exploited by vested interests to argue for technologies that are underdeveloped, unproven and potentially dangerous to sustain the status quo. Meanwhile, proven and deliverable changes such as large-scale demand management, which also have vast co-benefits for health and the wider environment, are marginalised or ignored.

The risks resulting from the growing chance of breaching the 1.5°C goal are an example of strategic risk in practice. Those seeking to achieve transformational change – including in policy, civil society and business – should more actively manage this risk. A systematic effort is needed to tackle threats and grasp

opportunities for rapid environmental action thrown up by the deepening consequences of the crisis: to make the green transition itself more resilient. Otherwise, the world could head further into a spiral of accelerating environmental shocks and counterproductive, defensive reactions.

We propose responses across three areas:

- **Politics:** Better anticipating and responding to narratives that favour delaying or blocking transformational change as temperatures approach 1.5°C, as part of a wider process of developing environmental narratives befitting the deepening challenges of the crisis.
- **Policy:** Decisively shifting beyond an incrementalist policymaking mindset and placing policies that can realise a system-wide transformation at the heart of advocacy.
- **Analysis:** Improving policy-relevant analyses and accessible communication of the complex risks resulting from the deepening climate and ecological crisis.

# 1. INTRODUCTION

A dangerous dynamic is emerging as the climate and ecological crisis deepens. The symptoms of the crisis – from worsening environmental shocks to their cascading impacts on globalised systems – could increasingly draw focus and resources away from tackling its root causes.

In this discussion paper, we explore this difficult dynamic through a case study: how the increasingly public conversation over the growing likelihood of breaching 1.5°C of global heating presents both threats and opportunities to realise transformational changes to societies that results in rapid decarbonisation.

The prospects for 1.5°C have long been a topic of private conversation. An anonymous survey of Intergovernmental Panel on Climate Change (IPCC) authors in 2021, for instance, found more than 75 per cent thought heating would reach or exceed 2.5°C by the end of the century (Tollefson 2021). This view is evident in arguments are being made by high-profile voices. They include *The Economist* magazine, which has urged the world to “say goodbye to 1.5°C” and that because “global warming cannot be limited to 1.5°C” it was “time for some realism” (The Economist 2022a). This is a controversial position and there is a growing debate over whether this argument should even be made. For example, Fatih Birol, executive director of the International Energy Agency (IEA), declared three weeks later that this view is “factually incorrect” and “not borne out by the data” (Harvey 2022).

The stories and policy proposals emerging from these conversations will impact what societies do next. Limiting heating to 1.5°C is still physically possible. It will require deep and sustained emissions reductions, with immediate action needed to ensure emissions peak in the next couple of years (IPCC 2022a). This can only happen if, in the words of the United Nations Environment Programme (UNEP), there is an “urgent system-wide transformation” of societies globally over the 2020s and beyond (UNEP 2022a). This is why Birol has also said that “proponents of the existing energy systems will be the beneficiaries if the obituary of 1.5°C is written” (Harvey 2022). Declaring the 1.5°C goal lost could benefit those who wish to delay rapid emissions reductions and use unproven and risky technologies to make potentially dangerous promises about how societies do not need significant change.

Transformational change, however, is not being delivered by the status quo. Something must give. This brings us back to that troubling, emergent dynamic: the deepening climate and ecological crisis is creating complex and difficult consequences that are increasingly impacting the prospects for societies to achieve rapid transformational change. We propose a range of measures for managing this risk, and conclude by urging a conversation on these complex, controversial issues.

## 2. TRANSFORMATIONAL CHANGE IS NEEDED

A central goal of global action to tackle the climate and ecological crisis is to limit the global average temperature increase to 1.5°C compared to pre-industrial levels (United Nations 2015).<sup>1</sup> All signatory countries to the 2016 Paris Agreement have signed up to limit global heating “well below 2°C” and to “pursu[e] efforts to limit the temperature increase to 1.5°C” (ibid). The United Nations (UN) has deemed 2°C as “an upper limit, a defence line that needs to be stringently defended”, and that limiting to 1.5°C could “significantly reduce the risks and impacts” of the climate crisis (ibid, Carbon Brief 2014, UNFCCC 2015). The 1.5°C goal was reaffirmed in November 2022 by the G20 and at COP27 (The White House 2022, United Nations 2022a).

Since the adoption of the Paris goals, successive policy commitments from governments have led the United Nations Environment Programme (UNEP) to revise its estimate of the average global heating in 2100 – from up to 3.4°C, the forecast made in 2016, to 2.8°C, as forecast in 2022 (UNEP 2016, UNEP 2022a). But alongside this relative progress has come the growing chance of an absolute failure: reaching and breaching the 1.5°C is increasingly likely. The global temperature was up to 1.1°C higher between 2001 and 2020 than the pre-industrial average (IPCC 2021). Historical cumulative emissions since 1850 amount to around four-fifths of the total emissions – or ‘carbon budget’ – allowed for even a 50:50 chance of limiting heating to 1.5°C (IPCC 2022b). The Global Carbon Project estimates that the remaining carbon budget is equivalent to nine years of emissions at 2022 annual emission levels from the start of 2023, as figure 2.1 illustrates (Friedlingstein et al 2022).

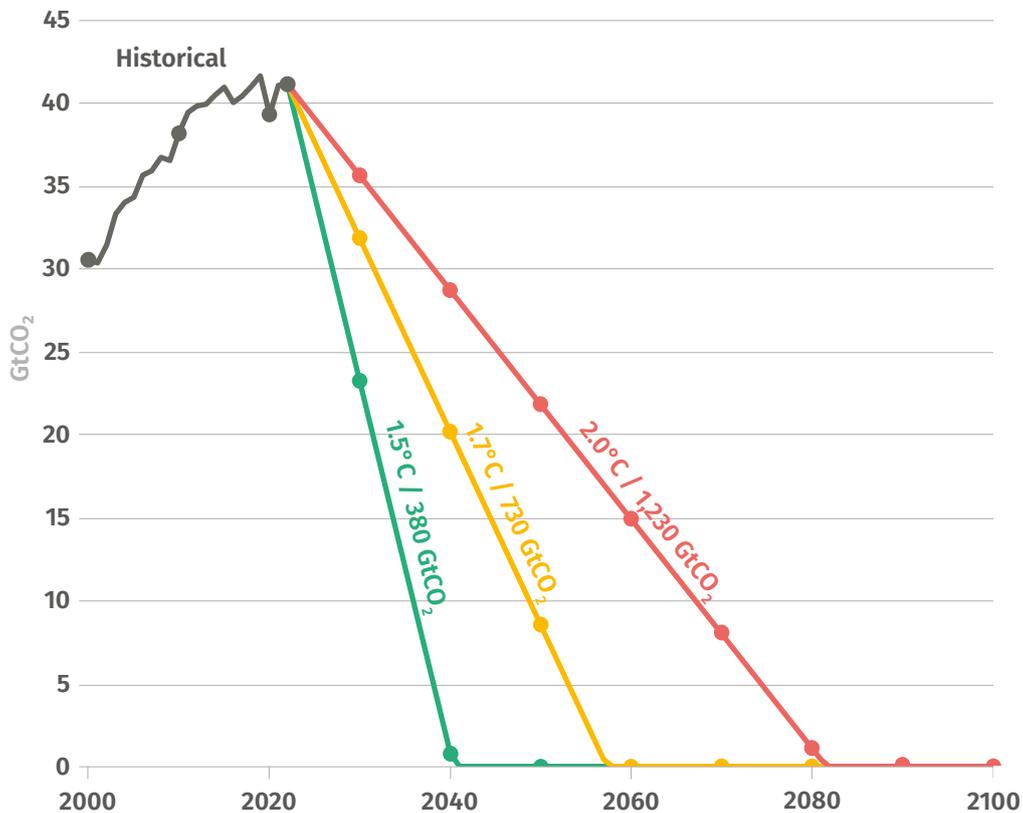
---

1 Human activity is destabilising multiple environmental systems, including the climate, biogeochemical flows and biodiversity, pushing their functioning beyond safe ‘planetary boundaries’ (Steffen et al 2015). We refer to this situation as the ‘climate and ecological crisis’ in recognition that the crisis goes beyond climate change alone.

**FIGURE 2.1**

**Deep and immediate emissions reductions are needed to put the world on a track to meet the Paris goals**

Annual carbon emissions to align with IPCC AR6 mitigation pathways to keep emissions within remaining carbon budgets for 1.5°C (380GtCO<sub>2</sub>), 1.7°C (730GtCO<sub>2</sub>) and 2°C (1,230GtCO<sub>2</sub>)



Source: Friedlingstein, Presentation on *Global Carbon Budget: 2022*, slide 62 'Remaining carbon budget', 'Global CO<sub>2</sub> pathways using IPCC AR6 Remaining Carbon Budgets' (Friedlingstein 2022)  
Note: Emissions are expressed in metric gigatonnes of carbon dioxide emitted (GtCO<sub>2</sub>)

The closer proximity to 1.5°C has two main implications:

1. the risks to societies from the climate and ecological crisis are growing
2. only a rapid and coordinated transformation of societies can realise the Paris goals.

**2.1 AS 1.5°C GETS CLOSER, THE RISKS INCREASE**

Current levels of heating are already having deadly impacts and imposing severe risks across the world and on environmental systems (Romanello et al 2022, IPCC 2022c). These fall disproportionately on countries and communities that have contributed little to causing the climate and ecological crisis but that are more exposed and vulnerable to its effects than are wealthier nations with higher emissions and greater environmental impact (Wiedmann et al 2020, Stoddard et al 2021).

Reaching and breaching 1.5°C pushes the world deeper into this danger zone across two dimensions.

- 1. Environmental consequences: abrupt changes are becoming increasingly likely.** The IPCC has concluded that continued heating to and over the 1.5°C limit will cause “unavoidable increases in multiple climate hazards” (IPCC 2022d). They will worsen other areas of environmental change and lead to irrevocable losses, such as the permanent alteration of ecosystems and biodiversity loss. Pressingly, the risk of passing tipping points in the global climate system – abrupt and irreversible changes – is higher than previously thought at heating below and above 1.5°C (Armstrong McKay et al 2022). Indeed, parts of the West Antarctic ice sheet may have already passed a tipping point and potential early warning signals have been detected for destabilisation in the Greenland ice sheet, Atlantic Meridional Overturning Circulation (AMOC) and the Amazon rainforest. Passing tipping points could lead to highly destructive, if not globally catastrophic events, such as a collapse of the AMOC causing significant declines in crop suitability globally (OECD 2021). These changes could also trigger tipping points in other climate elements, potentially creating cascading change across natural systems regionally and even globally (Armstrong McKay et al 2022).
- 2. Societal consequences: cascading and systemic risks are growing.** The consequences of the climate and ecological crisis for societies are often thought of in terms of two main risks (BIS 2021, Boushey et al 2021). First, physical risks resulting from environmental shocks, such as the increasing frequency and severity of heatwaves eroding labour productivity. Second, transition risks resulting from policy action, such as financial overexposure to fossil fuel investments that may abruptly lose value. These risks are growing and, in the case of physical risks, are more severe than was anticipated at the current levels of heating (IPCC 2022d). Physical and transition risks also have knock-on impacts that cascade through interconnected economic, social and political systems, reaching far beyond the original trigger (SIPRI 2022). Environmental shocks to food production, for instance, cause food price spikes and distribution problems, with implications for political, economic and social stability across the world (Quiggin et al 2021a). Cascading risks could be so severe that they create systemic risks that threaten the breakdown or even collapse of economic, social and political systems (Kemp et al 2022). Cascading and systemic risks could increase significantly as heating reaches and breaches 1.5°C, with one assessment concluding that without deep, near-term emissions reductions many of these cascading effects are “likely to be locked in by 2040 and become so severe they go beyond the limits of what nations can adapt to” (Quiggin et al 2021b).

While the 1.5°C goal might be a useful organising frame to spur action on the climate and ecological crisis, the already severe consequences of this crisis and its worsening risks underline that even 1.5°C is not a ‘safe’ limit for global heating. As some IPCC scientists have been at pains to remind the world, “every fraction of a degree of warming matters” (United Nations 2022b).

## **2.2 MEETING GLOBAL GOALS REQUIRES TRANSFORMATIONAL CHANGE**

The carbon budget remaining to achieve the 1.5°C goal imposes a considerable challenge for climate action: on average, emissions reductions greater than those resulting from the 2020 Covid-19 lockdowns are needed each year until 2050 for even a 50:50 chance of meeting the goal (Friedlingstein et al 2022). Rapid reductions are also needed to have a 50:50 chance of staying below 2°C, which has a remaining carbon budget equivalent to only 30 years of emissions at 2022 levels.

This has led UNEP to conclude that “incremental change is no longer an option: broad-based economy-wide transformations are required to avoid closing the

window of opportunity to limit global warming to well below 2°C, preferably 1.5°C” (UNEP 2022a). The delay in achieving these transformations has meant that change must occur on ever-shorter timescales (Stoddard et al 2021). Simultaneous transformations will now be needed across the decade of the 2020s, particularly in power generation, transportation, food systems, land management and financial systems (UNEP 2022a, IPBES 2019). While this will be difficult, policymaking can trigger constructive tipping points that drive rapid decarbonisation across societies (Sharpe and Lenton 2021). Examples include the collapsing price of renewables and accelerating market penetration of electric vehicles. Crucially, these transformations can have vast co-benefits for health, wellbeing and wider prosperity (IPCC 2022a).

Many proposals for policies to achieve these transformations include huge increases in public and private investment, the implementation of coordinated green industrial strategies by governments, avoiding new oil and gas infrastructure and any new fossil fuel extraction, and significant demand management including through energy efficiency and behaviour change (UNEP 2022a, UNRISD 2022). Enabling policies include boosting government fiscal capability through eliminating tax havens, ‘green’ mandates for central banks, and fundamental changes to economic treaties, international monetary policy and financial markets to reduce global power imbalances and increase the financial resilience of vulnerable countries (UNEP 2022a, UNRISD 2022, Schroeder and Palmer 2022). Implementation of many of these policies is contingent on a shift in mindset among policymakers away from the view that market forces are or must be the primary driver of change in societies and that policy change can only be achieved incrementally.

Running through these policy proposals is a focus on the need for a ‘just transition’ that ameliorates the injustices inherent to the climate and ecological crisis through actively supporting least responsible and most exposed and vulnerable communities and countries through financial and other support. Some proposals seek more fundamental change, such as the pursuit of explicit ‘de-growth’ or ‘post-growth’ strategies (UNRISD 2022).

Significant increases in adaptation to the inevitable effects of the climate crisis are also needed; these effects will only intensify in coming years even if emissions are reduced (UNEP 2022b). While measures for adaptation are on the increase globally, they are insufficient to keep pace with accelerating risks. International adaptation finance flows to developing countries are 5 to 10 times below estimated needs and the gap is widening (UNEP 2022b). Adaptation measures can be highly synergistic, helping reduce emissions while creating significant co-benefits to society (UNEP 2022b, IPCC 2022a).

For the purposes of this paper, we do not specify the policies needed to realise transformational change but conform with the view that the historical incrementalist approach to the climate and ecological crisis has clearly failed and so transformation is the only credible means to realising international goals. Such change is not currently being sought globally, let alone achieved.

# 3. QUESTIONING THE VIABILITY OF THE 1.5°C GOAL IMPACTS PROSPECTS FOR TRANSFORMATION

## 3.1 THE POSSIBILITIES FOR 1.5°C ARE COMPLEX

The dwindling carbon budget for 1.5°C and the greater requirements for change are giving licence to those who question the plausibility that the world can still meet this goal. As 1.5°C is still physically possible, anyone asserting that the goal is lost is making explicit or implicit judgements across the following two broad areas.

### 1. *The prospects for transformational change*

Though they have not been fully attempted, deep changes to societies and economies can be seen by some as unlikely, implausible or undesirable, and therefore the necessary emissions reductions will not (or should not) be made. A version of this argument was cited in the November 2022 edition of *The Economist*: “[Halving global emissions by 2030] is so completely outside the realm of the technology and economics and politics of the world. Is it technically feasible? I guess. But it’s so far from reality” (The Economist 2022b). Alternatively, it has been argued that deep changes are both possible and necessary but cannot be achieved with prevailing policies, institutions and decision-making systems, and the current balance of political and economic power (UNRISD 2022). Because these factors have proved extremely difficult to shift, the prospects for 1.5°C can be seen as dwindling or dead (Dyke 2022).

Eschewing the possibilities of transformational change and concluding that 1.5°C is lost might justify reliance on negative emissions technologies. These encompass a range of measures to remove emitted carbon from the atmosphere. Negative emissions on a sufficient scale might be seen as a route to achieve net-zero without deep and immediate emissions reductions, or a critical tool to bring down the temperature if 1.5°C is breached, potentially normalising the prospect of such an overshoot. Around 90 per cent of the scenarios in the IPCC’s 2018 special report on 1.5°C use negative emissions to meet the goal, with up to eight gigatonnes of carbon dioxide per year (GtCO<sub>2</sub>/yr) removed by 2050 in no to limited overshoot scenarios (about a quarter of current yearly emissions) (IPCC 2018, Quiggin 2021c). Negative emissions of this scale are subject to feasibility concerns and might come with significant social and environmental effects, including displacement of biodiversity or food production, or the lock-in of high-temperature pathways (Quiggin 2021c, IPCC 2022d, Anderson and Peters 2016).

One recent assessment concluded that a worst-case scenario of poorly implemented negative emissions policies could “delay or deter emissions reductions, fail to deliver the removals currently being baked in by policymakers and net zero pledges, and result in ‘imagined offsets’ that fail to materialize, which ... could result in an additional temperature rise of up to 1.4°C” (Quiggin 2021c).

## 2. The scale of risk and the ability of societies to manage

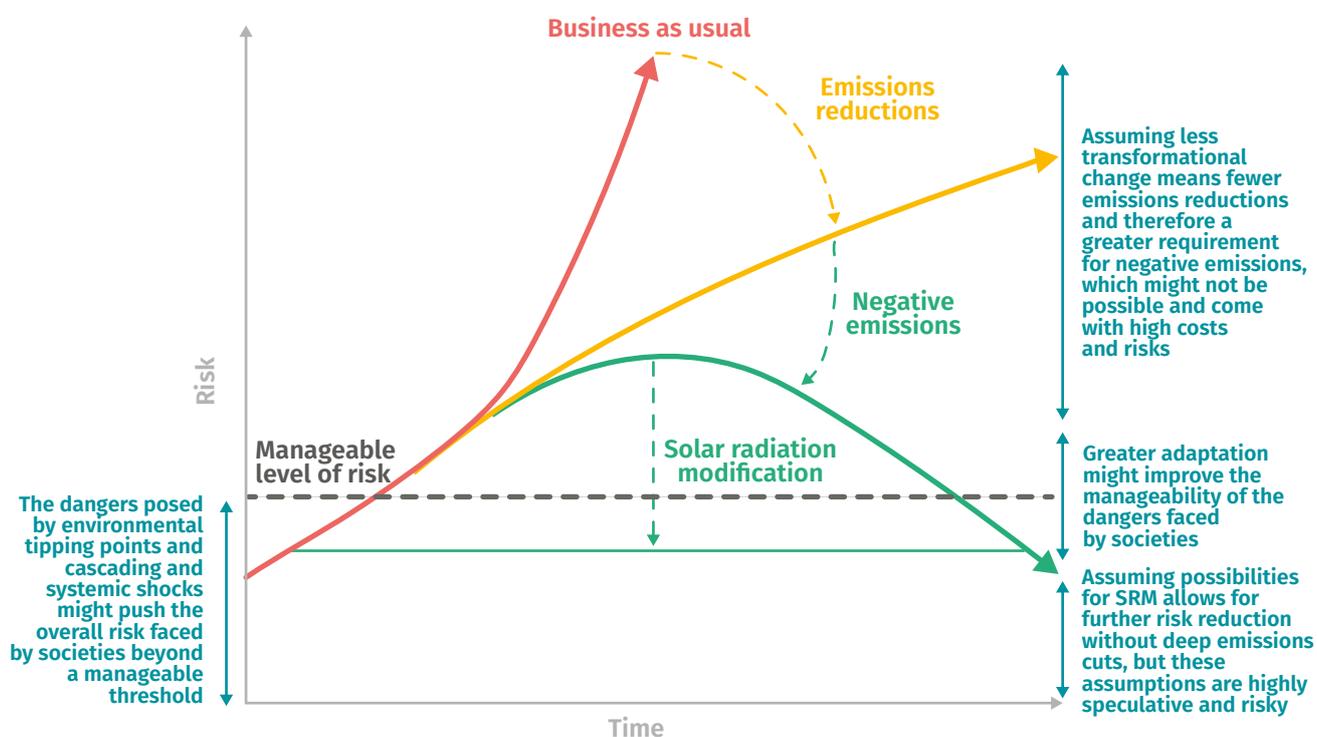
Those who conclude 1.5°C is lost are making judgements on whether societies can handle the resultant impacts and what this will mean for the most vulnerable and exposed, and the acceptability of impacts on these groups around the world. The latest analyses of environmental tipping-point risks, cascading and systemic societal risks, and their plausible worst-case scenarios are generally missing or downplayed in assessments of the climate and ecological crisis (Kemp et al 2022, Homer-Dixon et al 2022). The severe dangers presented by these risks give credence to arguments that delivering emergency action to transform societies is now a pressing necessity.

The growing danger has led to increased interest in methods to reflect sunlight and thus temporarily reduce temperatures during an overshoot of 1.5°C. These solar radiation modification (SRM) methods include injecting reflective aerosols into the stratosphere and seeding clouds above ocean surfaces, and are largely untested. Understanding of SRM methods is in its infancy and their use and research are not sufficiently governed globally (CCGGI 2018). The IPCC has warned that while some SRM methods might be theoretically effective, they face large uncertainties and ethical and other risks, and do not mitigate ocean acidification and some other impacts (IPCC 2018).

**FIGURE 3.1**

**The promise of negative emissions and solar radiation modification technologies might be used as a substitute for deep emissions reductions achieved through transformative changes to societies**

*Illustration of how a mix of negative emissions, solar radiation modification and adaptation – and assumptions over their possibilities and impact – might be used to justify fewer emissions reductions as a means to achieve a subjective ‘manageable’ level of risk for societies resulting from global heating to and beyond 1.5°C (the relationship between risk levels is illustrative)*



Source: Authors’ analysis, adapted from Carnegie Climate Geoengineering Governance Initiative policy brief ‘Governing Solar Radiation Modification’ (CCGGI 2018)

### 3.2 STORIES ABOUT 1.5°C MATTER

Those who are arguing that 1.5°C is lost – as well as those still defending its prospects – are seeking to influence what societies do in response to the deepening climate and ecological crisis. The arguments and policy proposals emerging from the debate over prospects for 1.5°C will have an impact on whether societies seek and are able to achieve the transformational change needed to still provide a chance of meeting the goal.

These arguments can be exploited to justify incremental action and to continue a slow pace for emissions reductions. For example, those defending the prospects for limiting heating to 1.5°C often emphasise that it is physically possible and while the carbon budget is dwindling, they argue that the possibility of meeting the goal is still the best motivator for realising rapid emissions reductions. Let's call this the 'stay the course' argument. However, this remaining possibility might create a false impression that the current approach is working, thereby reinforcing a complacency that the status quo can still deliver rapid emissions reductions instead of a realisation that deeper change is needed. This complacency can be seized upon by those who do not want deeper change, who then argue, for instance, that deploying vast negative emissions in the future further relaxes the requirement for significant change today. These claims are speculative and risky and can therefore be described as 'discourses of climate delay', a term in the academic literature to identify discourses that "accept the existence of climate change but justify inaction or inadequate efforts" (Lamb et al 2020).

Meanwhile, those arguing that 1.5°C is lost might agree that transformative change is both possible and the only credible means for limiting temperature rises. But they see no plausible way to overcome the social, political and economic forces that act to block paths to transformation within the time needed. In turn, they might attempt to use the shocking reality of breaching 1.5°C to mobilise change that could overcome these forces. This is the 'wake-up call' argument. It comes with risks, including the pessimistic interpretation that the failure to shift barriers to transformative change to meet the crucial goal of 1.5°C in the past shows that these barriers are insurmountable.

We could call this the 'misguided pragmatism' counterargument: 1.5°C is not politically, economically or socially possible (and may never have been) and this shocking reality should focus minds on pursuing more adaptation and deployment of negative emissions and solar radiation modification technologies, alongside rapid emissions reductions achieved by what are claimed to be 'more realistic' levels of societal change. Once again, this argument is prone to being exploited by those propagating discourses of delay because it dismisses out of hand the possibilities for transformative change.

There are many other narratives being told around 1.5°C, each with their own agenda and risks. In reality, transformational change is not being achieved and so the chance that the 1.5°C goal will be missed is growing. Something must change. But the complexities of the crisis mean that arguments about how this happened and what comes next carry some risk of being exploited by those who wish to avoid deep change and continue to delay rapid emissions reductions. This difficult situation is made all the harder by the inherent ambiguity in judging whether the 1.5°C goal is lost or not, which is determined by a range of factors, four of which are set out below.

### **1. The long-term global heating average**

1.5°C will probably be deemed to have passed when the average global surface temperature over the preceding 20-year period reaches 1.5°C higher than the average between 1850 and 1900, which is seen as the 'pre-industrial' period (Marotzke et al 2022). Even though exceedance of the long-term average is used by scientists to identify the moment at which 1.5°C is reached, even this measure has ambiguities. The Paris Agreement does not specifically define an appropriate period for the current average nor the pre-industrial baseline (ibid). Measurement of the average is itself uncertain, with the IPCC's most recent report concluding that the "likely range of total human-caused global surface temperature increase from 1850–1900 to 2010–2019 is 0.8°C to 1.3°C, with a best estimate of 1.07°C" (IPCC 2021, emphasis in original/added). This means that breaching 1.5°C might only be identified retrospectively.

### **2. Temporary breach of 1.5°C**

According to the UK Met Office this is increasingly likely with a 48 per cent chance in at least one year to 2027 (Madge 2022). While climate scientists are clear that only the long-term average matters for exceedance, temporarily hitting 1.5°C might underline to some that the goal will soon be lost or be misconstrued as the moment it is lost.

### **3. Depleted carbon budget**

Nine more years of global emissions at 2022 levels could deplete the allowed budget for 1.5°C. While there are uncertainties as to the exact heating that will result (due to uncertainties over climate sensitivity), a depleted carbon budget could make it impossible to argue that sufficient emissions reductions were still plausible.

### **4. Overshoot and return**

The prospects for 'overshoot and return' – where heating temporarily exceeds 1.5°C during the century but is brought down by 2100 through emissions reductions and negative emissions – might justify maintaining the 1.5°C goal, particularly when considering the significant increase in environmental and societal risks towards 2°C. It must be remembered that these severe risks increase significantly up to and beyond 1.5°C.

## 4.

# THE GENERAL CASE: THE DEEPENING CRISIS PRESENTS THREATS AND OPPORTUNITIES FOR CHANGE

The risk that the growing likelihood of breaching 1.5°C can be exploited by discourses of delay could be seen as one example of a wider dynamic: the growing consequences of the climate and ecological crisis are creating challenges to the ability of societies to focus on and deliver transformational change. This dynamic might be most apparent when considering how the increasingly severe symptoms of the crisis could act as a drag on resources at a time when there are unprecedented demands on all sections of society to tackle the crisis's root causes.

2022 saw a string of destructive climate shocks across the world, including the catastrophic floods affecting Pakistan. Climate shocks are taking a severe toll, particularly on societies across the global South. For example, it is estimated that the African economy is already losing up to 15 per cent of GDP per capita growth annually to the worsening effects of global heating (AfDB 2022).

In a world heading to and potentially beyond 1.5°C, it will be evermore important that sufficient resources are made available to support efforts to reduce emissions and improve adaptation, even with the growing requirement to respond to progressively more severe crises. But the spiralling costs could become increasingly severe. For example, the African Development Bank has warned that heating above 1.5°C would mean the continent faces “exponential collateral damage, posing systemic risks to its economies, infrastructure investments, water and food systems, public health, agriculture, and livelihoods, threatening to undo its modest development gains and slip into higher levels of extreme poverty” (ADBP 2023). CARE has concluded that the accelerating scale of costs “will significantly hamper [African] countries’ possibilities not only to pursue sustainable development goals, but also to invest into the necessary adaptation and resilience as well as mitigation measures” (Harmeling 2022).

Conversely, the consequences of the deepening crisis can also enhance agency, helping focus attention and action. Growing environmental concern driven, for example, by worsening environmental shocks and their cascading effects could feed into rapid political change that increases the ambition of policies, accelerating emissions reductions (Otto et al 2020).

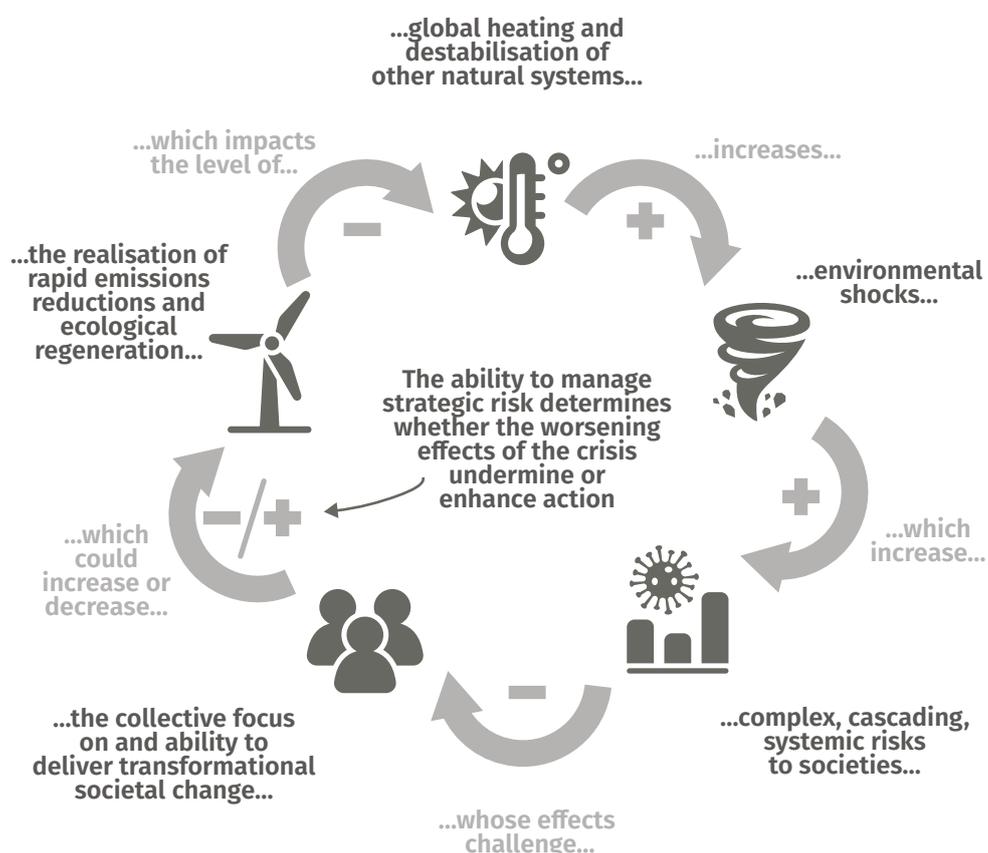
As global heating heads to and potentially beyond 1.5°C, environmental shocks will worsen and cascading and systemic risks for societies will grow. The reaction of societies and how they cooperate under these worsening conditions could become a major determinant of whether the world is able to deliver transformational change and avoid the worst environmental outcomes. We define this as a ‘strategic risk’ to the transition that is needed to reach more sustainable, resilient and equitable societies. A systematic effort is needed to tackle threats and grasp opportunities for the transition thrown up by these conditions: to make the transition itself more resilient.

Broadly, the societal reactions to worsening conditions could create destructive dynamics whereby societies are increasingly distracted or even become overwhelmed by the symptoms of the crisis, eroding efforts to tackle its root causes. This will deepen the crisis's consequences, creating greater distractions and demands on resources: a doom loop. But this loop can be broken. The reactions to deepening consequences could also create constructive dynamics where agency to reduce emissions, regenerate nature and improve resilience is enhanced as awareness and action grow in response to deepening danger (as illustrated in figure 4.1). The interplay of these dynamics can be observed in how the effects of the Covid-19 pandemic and the energy crisis have both helped and hindered efforts to reduce emissions and improve systemic resilience since 2020.

**FIGURE 4.1**

**How societies react to the worsening consequences of the climate and ecological crisis could enhance or erode collective agency to deliver transformational change**

*Stylised diagram of the relationship between the effects of the climate and ecological crisis and the ability of societies to collectively address its root causes*



Source: Authors' analysis

Note: Positive feedbacks are illustrated with a plus, negative feedbacks by a minus.

## NAVIGATING THE STORM

An analogy can illustrate this strategic risk to the transition.

Imagine standing on a ship and spotting a storm on the horizon. The storm represents the climate and ecological crisis and its risks. The challenge for environmentalism over the past few decades was to persuade the crew – representing decision-makers as well as wider society – of the storm's existence. Next, the ship's bearing had to be changed and contingencies made for the worsening weather closer to the storm: realising policy change to reduce emissions, regenerate nature and adapt societies to inevitable impacts. However, the course was not sufficiently changed, and the ship and its crew are now in the storm and heading deeper into it.

The first challenge remains: to get away from the storm. But this imperative is joined by another challenge: the need to manage the impacts of the storm on the ship and its crew, analogous to the worsening shocks and complex, systemic risks that the climate and ecological crisis is increasingly bringing. Crucially, this could undermine capability to steer away from the storm: that is, the ability to achieve transformational change in societies across the world that realise rapid emissions reductions and regeneration of nature. Societies could become increasingly bound up or even overwhelmed by the symptoms of the crisis, undermining action on the root causes.

The risks to achieving transformational change resulting from the growing likelihood of breaching 1.5°C could be seen as a special case of this general situation. A worst-case scenario is that these dynamics push global emissions reductions and nature regeneration below a critical threshold needed to avoid cascading environmental change.

# 5.

## RESPONDING TO STRATEGIC RISK

Strategic risk is growing. Transformational change is not being realised at a sufficient scale and pace. If this continues, environmental hazards and the destabilising consequences for societies will further grow, as will the danger of triggering tipping points in environmental systems. Therefore, societies will be increasingly called upon to ensure the symptoms of the climate and ecological crisis do not derail action to tackle its root causes. Conversely, societies must not let the opportunities for change that arise out of instability and the necessity for action go to waste.

The ability of societies to do so can be enhanced by building capacities to better anticipate and respond to strategic risk, and to amplify constructive responses and dampen destructive ones. We explore three broad areas across which an agenda for doing so could be developed, and that can be relevant for a range of actors playing a role in urging and delivering transformational change, including policymakers, civil society and business.

### 5.1 POLITICS

#### *1. Responding to the risks posed by arguments over 1.5°C*

Those who propagate or have influence over narratives of the climate and ecological crisis need to understand how these narratives can enhance or erode prospects for transformational change as the consequences of the crisis grow. The stories told in response to the greater chance of reaching and breaching 1.5°C is a pressing example. More honesty is needed in recognising that mainstream narratives have not yet driven sufficient change and that alternatives will have to navigate the risks of fuelling discourses of delay.

#### *2. Politics of emergency*

The recognition that only transformational change gives the world a chance of meeting the Paris goals shows that the world is now in an emergency (The Club of Rome 2019). Societies assume a different footing in response to emergencies, as we saw in early 2020 when countries undertook extraordinary action in response to the Covid-19 pandemic. Into the future, societies could be forced onto an emergency footing by the impacts of reaching and breaching heating of 1.5°C. Or they can choose to go onto a footing to deliver pre-emptive transformational change. In both scenarios, a form of emergency politics is inevitable, but the latter provides more constructive opportunities.

#### *3. Fairness affects trust*

Trust is an important factor in how societies respond to crises, affecting cooperation with authorities and among citizens. As the consequences of the climate and ecological crisis grow, it will be important to protect and deepen trust, particularly as high levels of trust will be needed to deliver transformational change. Perceptions of fairness are important determinants of trust, and so the imperative for enhancing equity will only increase as the world heads to and potentially beyond 1.5°C.

## 5.2 POLICY

### 1. Transformational policymaking

It is now imperative to place policies that realise a system-wide transformation at the heart of advocacy on the climate and ecological crisis. This will require engagement by climate and environmental policymakers with enabling policy areas, such as public finances, where a continued focus on austerity constrains vast green public investments. In turn, a deeper shift in the prevailing mindset of policymaking is needed to unlock policies that can realise deep and rapid transformations of societies, particularly in using policy to trigger positive tipping points – such as has occurred with the rapid deployment of green technologies in the power and road transport sectors in some countries (Sharpe and Lenton 2021). Transformational policymaking also demands an open mind about alternatives to entrenched political-economic assumptions – such as a fixation on compounding material growth as the lodestar of societal progress (OECD 2020).

### 2. Synergistic adaptation

Countries are not resilient to the current consequences of the climate and ecological crisis and a growing adaptation gap will only deepen crisis conditions, which in turn will increase the costs of adaptation (UNEP 2022b). In turn, this creates a greater potential for strategic risk to derail focus and action on the root causes of the crisis. This is another argument for closing the adaptation gap: greater resilience can ensure societies are better able to maintain support for and ability to deliver mitigation action, and exploit opportunities to drive faster change. But concepts of adaptation need to expand. Because they impact across societies, cascading and systemic risks mean that greater resilience is needed in areas and across systems that are not traditionally associated with the climate and ecological crisis – such as healthcare, social cohesion and political cooperation (Laybourn-Langton et al 2020). In turn, more resilient systems can also have lower emissions and help regenerate nature.

### 3. Pre-empt policy traps

The policy responses to conditions emerging to and beyond 1.5°C could themselves create strategic risks. Such ‘policy traps’ include a continued lack of governance increasing the chance of dangerous and counterproductive efforts to modify solar radiation (SRM) use, leading to unintended warming and destructive impacts on ecosystems (Felgenhauer et al 2022). More effort is needed to anticipate and act on these issues beforehand.

## 5.3 ANALYSIS

### 1. Complex risk assessments and early warning systems

Improvements are needed in analytical capabilities for identifying and assessing environmental tipping point risks and their associated cascading and systemic risks across societies (Kemp et al 2022, Homer-Dixon et al 2022). These capabilities should include ‘decision grade information’ that is most relevant to policymakers, including data on probabilities, timelines, early warning monitoring and a higher resolution on potential impacts. In turn, these capabilities should be used to begin mapping strategic risk itself, identifying potential threats and opportunities to the transition from the consequences of the deepening environmental crisis.

### 2. Communicators of complexity

Judging prospects for transformative change as the climate and ecological crisis deepens is complex and requires insights from and between a range of disciplines. Often, communicators from particularly high-profile sectors or academic disciplines are called upon to provide general insights on the crisis and the prospects for transformational action, even though these communicators might not have a sufficient breadth of knowledge about the complexities of these subjects. This might bias narratives against the prospects for transformation, or downplay the complex risks of approaching 1.5°C. A new class of communicators is needed who can help audiences navigate the deepening complexities of responding to and navigating strategic risk.

## 6. CONCLUSION: WE NEED TO TALK ABOUT STRATEGIC RISK

The world is in a bind. On the one hand, the status quo has been unable so far to realise the rapid and systemic transformation that the UN says is needed to limit heating to 1.5°C. On the other, pointing to the growing chance that 1.5°C could soon be breached can bolster discourses of delay and undermine prospects for transformational change. This is a brutal consequence of the failures of historical action to address the climate and ecological crisis. Narratives are needed that are able to convey the accelerating danger and spur rapid, transformative change – and are more robust to exploitation by fossil interests and other delayers.

As we have argued, this problem is one example of a wider ‘strategic risk’ to the ability of societies to achieve sufficient change to avoid catastrophic climate and ecological change. Capabilities to spot and manage strategic risk will have to be developed so that the prospects for transformational change are not just protected but deepened as these consequences grow. As we see with the intensity of arguments over 1.5°C, facing up to strategic risk is difficult. To make assumptions about the future course of the climate and ecological crisis can be construed as defeatist or introducing moral hazard. Yet scenario and contingency planning is essential to the success of any strategy.

A challenging conversation is sorely needed on the issues. The growing recognition that the world’s many crises are interrelated and deepening – amounting to a state of ‘polycrisis’ (Tooze 2022) – provides an opportunity to do so. This conversation cannot be held purely in private. The ability of societies to deliver transformational change as the climate and ecological crisis deepens, and its effects spill across the world, will be a function of cooperation. Effort is needed to help populations face up to and prepare for the magnitude of the challenges to come. One particular need is to help younger generations, who will bear the greater brunt of strategic risk over careers that extend to and beyond 2050, when global goals should be met. This is the focus of the Cohort 2040 project, which will be releasing more discussion papers to explore how to respond to strategic risk (Laybourn-Langton 2022). These generations will soon be called upon to navigate in the throes of a deepening storm.

# REFERENCES

- African Development Bank Group [AfDB] (2022) 'Africa loses up to 15% of its GDP per capita annually because of climate change – African Development Bank Acting Chief Economist Kevin Urama', 12 September 2022. <https://www.afdb.org/en/news-and-events/press-releases/africa-loses-15-its-gdp-capita-annually-because-climate-change-african-development-bank-acting-chief-economist-kevin-urama-54660>
- African Development Bank Group [AfDB] (2023) 'Climate Change in Africa', webpage. <https://www.afdb.org/en/cop25/climate-change-africa>
- Anderson K and Peters G (2016) 'The trouble with negative emissions', *Science*, 354(6309). <https://doi.org/10.1126/science.aah4567>
- Armstrong McKay D, Staal A, Abrams J, Winkelmann R, Sakschewski B, Loriani S, Fetzer I, Cornell S, Rockstrom J and Lenton T (2022) 'Exceeding 1.5°C global warming could trigger multiple climate tipping points', *Science*, 377(6611). <https://doi.org/10.1126/science.abn7950>
- Bank for International Settlements [BIS] (2021) 'Climate-related risk drivers and their transmission channels'. <https://www.bis.org/bcbs/publ/d517.pdf>
- Boushey H, Kaufman N and Zhang J (2021) 'New tools needed to assess climate-related financial risk', *The White House Issue Briefs*. <https://www.whitehouse.gov/cea/written-materials/2021/11/03/new-tools-needed-to-assess-climate-related-financial-risk-2/>
- Carbon Brief (2014) 'Two degrees: The history of climate change's speed limit', 8 December 2014. <https://www.carbonbrief.org/two-degrees-the-history-of-climate-changes-speed-limit/>
- Carnegie Climate Geoengineering Governance Initiative [CCGGI] (2018) *Governing solar radiation modification*. [https://www.c2g2.net/wp-content/uploads/C2G2\\_Solar-Brief-hyperlink.pdf](https://www.c2g2.net/wp-content/uploads/C2G2_Solar-Brief-hyperlink.pdf)
- Dyke J (2022) 'Acknowledging global warming will exceed 1.5 does not mean we give up on the aims of the Paris Agreement'. <https://www.jamesgdyke.info/acknowledging-global-warming-will-exceed-1-5-does-not-mean-we-give-up-on-the-aims-of-the-paris-agreement/>
- Felgenhauer T, Bala G, Borsuk M, Brune M, Camilloni I, Wiener JB and Xu J (2022) *Solar radiation modification: A risk-risk analysis*, Carnegie Climate Governance Initiative (C2G). <https://www.c2g2.net/wp-content/uploads/202203-C2G-RR-Full.pdf>
- Friedlingstein P, O'Sullivan M, Jones M, Andrew R, Gregor L, Hauck J, Le Quéré C, Luijkx I, Olsen A, Peters G, Peters W ... and Zheng B (2022) 'Global carbon budget 2022', *Earth System Science Data*, 14(11): 4811–4900. <https://doi.org/10.5194/essd-14-4811-2022>
- Friedlingstein P (2022) 'Global carbon budget: Presentation', 11 November 2022. <https://www.globalcarbonproject.org/carbonbudget/22/presentation.htm>
- Harmeling S (2022) *Climate Loss and Damage in Africa: Massive Costs on the Horizon*, CARE. <https://careclimatechange.org/climate-loss-and-damage-in-africa-massive-costs-on-the-horizon>
- Harvey F (2022) 'Giving up on 1.5C climate target would be gift to carbon boosters, says IEA head', *Guardian*, 30 November 2022. <https://www.theguardian.com/environment/2022/nov/30/giving-up-on-15c-climate-target-would-be-gift-to-carbon-boosters-says-iea-head>
- Homer-Dixon T, Renn O, Rockstrom J, Donges JF and Janzwood S (2022) 'A call for an international research program on the risk of a global polycrisis'. <https://dx.doi.org/10.2139/ssrn.4058592>
- Intergovernmental Panel on Climate Change [IPCC] (2018) *Special report: Global warming of 1.5C*. <https://www.ipcc.ch/sr15/>

- Intergovernmental Panel on Climate Change [IPCC] (2021) *The physical science basis: Contribution of Working Group I to the sixth assessment report of the Intergovernmental Panel on Climate Change: Summary for policymakers*. [https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC\\_AR6\\_WGI\\_SPM.pdf](https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_SPM.pdf)
- Intergovernmental Panel on Climate Change [IPCC] (2022a) *Climate change 2022: Mitigation of climate change: Contribution of Workshop III to the sixth assessment report of the Intergovernmental Panel on Climate Change*. [https://report.ipcc.ch/ar6/wg3/IPCC\\_AR6\\_WGIII\\_Full\\_Report.pdf](https://report.ipcc.ch/ar6/wg3/IPCC_AR6_WGIII_Full_Report.pdf)
- Intergovernmental Panel on Climate Change [IPCC] (2022b) *Climate change 2022: Mitigation of climate change: Contribution of Workshop III to the sixth assessment report of the Intergovernmental Panel on Climate Change: Summary for policymakers*. [https://www.ipcc.ch/report/ar6/wg3/downloads/report/IPCC\\_AR6\\_WGIII\\_SPM.pdf](https://www.ipcc.ch/report/ar6/wg3/downloads/report/IPCC_AR6_WGIII_SPM.pdf)
- Intergovernmental Panel on Climate Change [IPCC] (2022c) *Climate change 2022: Impacts, adaptation and vulnerability: Working Group II contribution to the sixth assessment report of the Intergovernmental Panel on Climate Change*. [https://report.ipcc.ch/ar6/wg2/IPCC\\_AR6\\_WGII\\_FullReport.pdf](https://report.ipcc.ch/ar6/wg2/IPCC_AR6_WGII_FullReport.pdf)
- Intergovernmental Panel on Climate Change [IPCC] (2022d) *Climate change 2022: Impacts, adaptation and vulnerability: Working Group II contribution to the sixth assessment report of the Intergovernmental Panel on Climate Change: Summary for policymakers*. [https://www.ipcc.ch/report/ar6/wg2/downloads/report/IPCC\\_AR6\\_WGII\\_SummaryForPolicymakers.pdf](https://www.ipcc.ch/report/ar6/wg2/downloads/report/IPCC_AR6_WGII_SummaryForPolicymakers.pdf)
- Intergovernmental Science–Policy Platform on Biodiversity and Ecosystem Services [IPBES] (2019) *Summary for policymakers: The global assessment report on biodiversity and ecosystem services*. <https://ipbes.net/global-assessment>
- Kemp L, Xu C, Depledge J and Lenton TM (2022) ‘Climate endgame: Exploring catastrophic climate change scenarios’, *PNAS*, 119(34). <https://doi.org/10.1073/pnas.2108146119>
- Lamb W, Mattioli G, Levi S, Roberts T, Capstick S, Creutzig F, Minx J, Muller-Hansen F, Culhane T and Steinberger J (2020) ‘Discourses of climate delay’, *Global Sustainability*, 3. <https://doi.org/10.1017/sus.2020.13>
- Laybourn-Langton L, Emden J and Hill T (2020) *We are not ready: Policymaking in the age of environmental breakdown – Final report*, Institute for Public Policy Research. <https://www.ippr.org/research/publications/we-are-not-ready>
- Laybourn-Langton L (2022) *The cohort 2040 challenge*, Institute for Public Policy Research. <https://www.ippr.org/research/publications/the-cohort-2040-challenge>
- Madge G (2022) ‘Temporary breaching of 1.5C in next five years?’, *Met Office*, 8 May 2022. <https://www.metoffice.gov.uk/about-us/press-office/news/weather-and-climate/2022/decadal-forecast-2022>
- Marotzke J, Milinski S and Jones C (2022) ‘How close are we to 1.5 degC or 2degC of global warming?’, *Weather*, 77: 147–148. <https://doi.org/10.1002/wea.4174>
- Otto I, Donges J, Cremades R and Schnellhuber HJ (2020) ‘Social tipping dynamics for stabilizing Earth’s climate by 2050’, *PNAS*, 117(5): 2354–2365. <https://doi.org/10.1073/pnas.1900577117>
- Organisation for Economic Co-operation and Development [OECD] (2020) *Beyond growth: Towards a new economic approach*. <https://www.oecd.org/governance/beyond-growth-33a25ba3-en.htm>
- Organisation for Economic Co-operation and Development [OECD] (2021) *Managing climate risks, facing up to losses and damages*. <https://doi.org/10.1787/55ea1cc9-en>
- Quiggin D, Townend R and Benton TG (2021a) *What near-term climate impacts should worry us most? Supporting the most exposed and vulnerable societies to reduce regional and global climate risks*, Chatham House. <https://www.chathamhouse.org/2021/10/what-near-term-climate-impacts-should-worry-us-most>
- Quiggin D, De Meyer K, Hubble-Rose L and Froggatt A (2021b) *Climate change risk assessment 2021: The risks are compounding, and without immediate action the impacts will be devastating*, Chatham House. <https://www.chathamhouse.org/2021/09/climate-change-risk-assessment-2021>
- Quiggin D (2021c) *BECCS deployment: The risks of policies forging ahead of the evidence*, Chatham House. <https://www.chathamhouse.org/sites/default/files/2021-09/2021-10-01-beccs-deployment-quiggin.pdf>

- Romanello M, Di Napoli C, Drummond P, Green C, Kennard H, Lampard P, Scamman D, Arnell N, Ayebe-Karlsson S, Ford L, Belesova K ... Costello A (2022) 'The 2022 report of the Lancet Countdown on health and climate change: Health at the mercy of fossil fuels', *The Lancet*, 400(10363): 1619–1654. [https://doi.org/10.1016/S0140-6736\(22\)01540-9](https://doi.org/10.1016/S0140-6736(22)01540-9)
- Schroeder F and Palmer R (2022) 'The Bridgetown Initiative: A climate and development plan for COP27', *E3G*, 14 November 2022. <https://www.e3g.org/news/the-bridgetown-initiative-a-climate-and-development-plan-for-cop27/>
- Sharpe S and Lenton T (2021) 'Upward-scaling tipping cascades to meeting climate goals: Plausible grounds for hope', *Climate Policy*, 21(4): 421–422. <https://doi.org/10.1080/14693062.2020.1870097>
- Steffen W, Richardson K, Rockstrom J, Cornell S, Fetzer I, Bennett E, Biggs R, Carpenter S, De Vries W, De Wit C, Folke C, Gerten D, Heinke J, Mace G, Persson L, Ramanathan V, Reyers B and Sorlin S (2015) 'Planetary boundaries: Guiding human development on a changing planet', *Science*, 347(6223). <https://doi.org/10.1126/science.1259855>
- Stockholm International Peace Research Institute [SIPRI] (2022) *Environment of peace: Security in a new era of risk*. <https://sipri.org/publications/2022/other-publications/environment-peace-security-new-era-risk>
- Stoddard I, Anderson K, Capstick S, Carton W, Depledge J, Facer K, Gough C, Hache F, Hoolohan C, Hultman M and Hällström N (2021) 'Three decades of climate mitigation: Why haven't we bent the global emissions curve?', *Annual Review of Environment and Resources*, 46(1): 653–689. <https://doi.org/10.1146/annurev-environ-012220-011104>
- The Club of Rome (2019) *Planetary emergency plan*. <https://www.clubofrome.org/publication/the-planetary-emergency-plan/>
- The Economist (2022a) 'The world is missing its lofty climate targets. Time for some realism', 3 November 2022. <https://www.economist.com/leaders/2022/11/03/the-world-is-missing-its-lofty-climate-targets-time-for-some-realism>
- The Economist (2022b) 'The world is going to miss the totemic 1.5C climate target', 5 November 2022. <https://www.economist.com/interactive/briefing/2022/11/05/the-world-is-going-to-miss-the-totemic-1-5c-climate-target>
- The White House (2022) 'G20 Bali leaders' declaration', *The White House Briefing Room*, 16 November 2022. <https://www.whitehouse.gov/briefing-room/statements-releases/2022/11/16/g20-bali-leaders-declaration/>
- Tollefson J (2021) 'Top climate scientists are sceptical that nations will rein in global warming', *Nature*, 1 November 2021. <https://www.nature.com/articles/d41586-021-02990-w>
- Tooze, A (2022) 'Welcome to the world of the polycrisis', *Financial Times*, 28 October 2022. <https://www.ft.com/content/498398e7-11b1-494b-9cd3-6d669dc3de33>
- United Nations (2015) *Paris Agreement*. [https://unfccc.int/sites/default/files/english\\_paris\\_agreement.pdf](https://unfccc.int/sites/default/files/english_paris_agreement.pdf)
- United Nations (2022a) *Draft Text on COP27 Overarching Decision*. [https://unfccc.int/sites/default/files/resource/1CMA4\\_1CMP17\\_1COP27\\_preliminary\\_draft\\_text.pdf](https://unfccc.int/sites/default/files/resource/1CMA4_1CMP17_1COP27_preliminary_draft_text.pdf)
- United Nations (2022b) 'Voices from COP27: Jim Skea: Every fraction of a degree of warming matters'. <https://www.un.org/en/climatechange/voices-from-cop27/jim-skea>
- United Nations Environment Programme [UNEP] (2016) *Emissions gap report 2016*. <https://www.unep.org/resources/emissions-gap-report-2016>
- United Nations Environment Programme [UNEP] (2022a) *Emissions gap report 2022*. <https://www.unep.org/resources/emissions-gap-report-2022>
- United Nations Environment Programme [UNEP] (2022c) *Adaptation gap report 2022: Too little, too slow*. <https://www.unep.org/resources/adaptation-gap-report-2022>
- United Nations Framework Convention on Climate Change [UNFCCC] (2015) *Report on the structured expert dialogue on the 2013-2015 review*. <https://unfccc.int/resource/docs/2015/sb/eng/inf01.pdf>
- United Nations Research Institute for Social Development [UNRISD] (2022) *Crises of inequality: Shifting power for a new eco-social contract*. <https://www.unrisd.org/en/library/publications/crises-of-inequality>
- Wiedmann T, Lenzen M, Keyber LT and Steinberger J (2020) 'Scientists' warning on affluence', *Nature Communications*, 11(3107). <https://doi.org/10.1038/s41467-020-16941-y>

Institute for Public Policy Research



## **GET IN TOUCH**

For more information about the Institute for Public Policy Research, please go to [www.ippr.org](http://www.ippr.org)

You can also call us on +44 (0)20 7470 6100, e-mail [info@ippr.org](mailto:info@ippr.org) or tweet us @ippr

### **Institute for Public Policy Research**

Registered Charity no. 800065 (England & Wales), SC046557 (Scotland), Company no, 2292601 (England & Wales)

**The progressive policy think tank**