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Governments must reconcile dissonant climate assessment approaches

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Security analysts and government economists increasingly present policymakers with different pictures of the same climate and nature risk. We argue that governments need a shared way to weigh these assessments, particularly given under-preparing for a severe, irreversible outcome costs far more than over-preparing.

Governments increasingly assess climate and nature risk through two approaches that often reach different conclusions. The first is security assessment, applying the same worst-case

methods used for other national threats. From this perspective climate and ecological change emerge as near-term, high-confidence threats to food, economic, and national security¹. The second is quantitative economic modelling, which draws on historical relationships, stylised assumptions, and cost-benefit reasoning to inform policy. It represents the economy as optimisable, frictionless, and is necessarily calibrated to what is currently known and computable². These two approaches were developed for different purposes and increasingly yield conflicting outputs, yet both feed the same overarching decisions on fiscal risk, public spending, adaptation, food and security. Unfortunately, governments generally do not have a common framework for reconciling these approaches (Box 1). As a result, policymakers are left with difficult-to-reconcile advice on how seriously to act, and what to spend, on climate risks.

Faced with two conflicting answers from economic modelling and risk modelling, decision makers need to find a way to reconcile the two approaches. It is worth noting the two ways of being wrong do not have the same costs. When an outcome is severe, irreversible, and has a non-negligible probability, under-preparing costs far more than over-preparing. That is, when the statistical distribution of damage risk is fat-tailed, the expected losses are dominated by the tail and the central estimate is the wrong statistic upon which to decide, however accurately it is calculated³. Further, over-preparation may be associated with largely unquantified, beneficial spill-over effects (for example rewilding for flooding prevention provides other benefits).

This is not to say economic advice is monolithic, it can include catastrophe modelling and stochastic damage modelling. However, the advice that ultimately reaches decision-makers is typically framed by central estimates from standard models. This is important because those central-estimate outputs are generally the ones written into policy documents. These can include fiscal risks, the cost-effectiveness of carbon budgets, and guidance governing adaptation spending. Policymakers are then apt to treat these risks as gradual and economically tractable and under-invest in resilience.

The evidence increasingly favours a more risk-based framework. Standard damage functions imply only modest losses even under severe warming because they anchor to central estimates³. Retaining fat tails and representing the persistence and global correlation of climate shocks can raise projected losses several-fold⁴. The physical record is similar, where worst-case sectoral outcomes at 2°C of warming can exceed the multi-model mean at 3°C or 4°C⁵. Nor can abrupt, self-amplifying change be excluded: several tipping elements cannot be ruled out within the Paris range, and as warming continues they shift from low-likelihood tail risks toward higher possibilities that can cascade⁶. On top of this, there is a tendency to “err on the side of least drama” in climate science⁷ with evidence of systematic underestimation of climate risk over time. At an international level, successive IPCC ‘burning embers’ place the same risks at progressively lower temperatures (Fig. 1a)⁸. At a national level, UK climate-risk assessments show the same trend (Fig. 1b). Because these outputs feed the economic models used for appraisal, and because scientific consensus and then policy models both lag observed change, the understatement is carried into government advice.

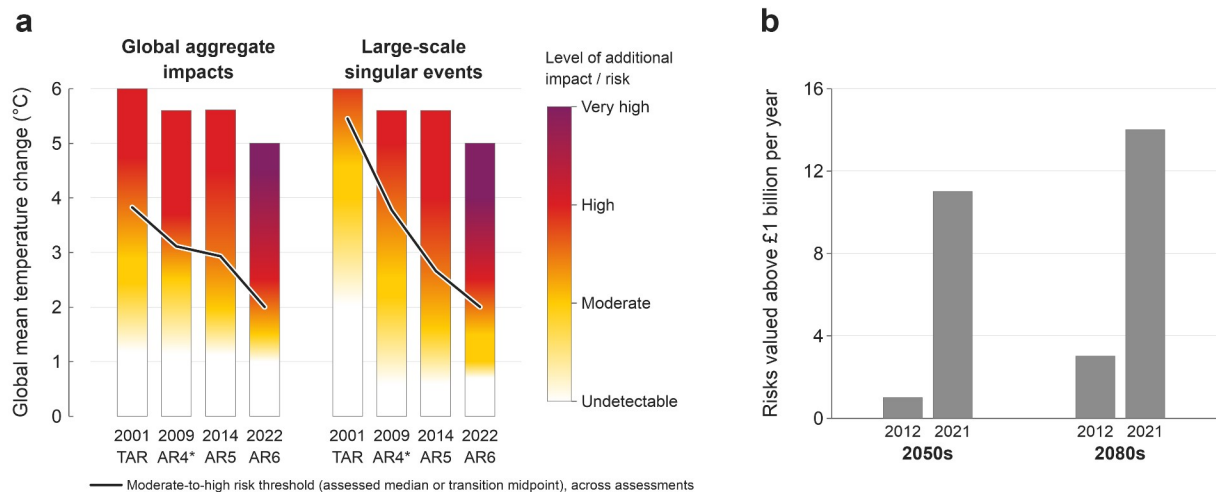


Fig. 1 | Successive assessments have revised climate risk upward, internationally and nationally. a, The IPCC’s ‘burning embers’ for two Reasons for Concern — global aggregate impacts and large-scale singular events — in 2001 (TAR), 2009 (AR4*, a peer-reviewed post-AR4 update¹⁶), 2014 (AR5), and 2022 (AR6), drawn from the published ember reconstruction database^{8,17}. Temperatures are expressed relative to a common 1850–1900 baseline, following that database’s conversion for the 2001–2014 embers; each ember is drawn over the range its assessment covered, up to the axis limit. The line traces the moderate-to-high risk transition, using the assessed median where a report provides one (2014, 2022) and the midpoint of the transition range otherwise. The 2018 SR1.5 update is omitted as it assessed risks only up to 2.5 °C, truncating its transitions at that ceiling. **b,** The number of UK climate risks with damages valued above £1 billion per year at the 2050s and 2080s horizons, in the first (CCRA1, 2012) and third (CCRA3, 2021) UK Climate Change Risk Assessment cycles, counted from the CCRA1–CCRA3 comparison figure of ref. 18, whose valuation bands define ‘very high’ as more than £1 billion per year. Cells spanning two valuation bands are resolved to the upper band, following that report’s own count for the 2012 assessment; 2080s values for the 2021 cycle use the 2 °C pathway, the more conservative of the report’s two scenarios. It cautions that the assessed risk lists changed significantly between cycles.

This phenomenon is now coming to the fore as institutional risk planning is having to react faster to environmental events. The problem is the integration of these viewpoints, and the gap that may widen as impacts grow. This is not unique to the UK. In its 2023 Climate Economic and Fiscal Assessment, New Zealand’s Treasury suggests its economy may be ‘relatively resilient’ to droughts and storms and the country ‘fiscally resilient’ to severe extreme weather, even as the country’s 2021 defence assessment names climate change one of two principal challenges to its defence interests, with impacts ‘being felt early and deeply’ in the Pacific. A European Union risk-based estimate puts agricultural climate losses near €28 billion a year and €40 billion by 2050, far above the optimisation-based scenarios shaping policy⁹.

Reconciling the channels means modernising their integration rather than choosing between economics and security. Three shifts would help (Box 2): presenting confidence-tiered expert

judgement alongside model best-estimates rather than point estimates alone; separating no-regret actions from those involving trade-offs and from high-stakes, irreversible commitments, and holding each to a different standard of evidence; and bringing different risks into one shared framework rather than separate channels that are opaque to one another. Methods for decision making under deep uncertainty can do much of this, seeking policies that perform acceptably across many plausible futures rather than optimising for an expected one, but this decision making remains weakly integrated into climate-economic advice at the highest levels¹⁰.

Governments have adopted new approaches before. Pandemic planning relied on central estimates until COVID-19 prompted a shift toward reasonable-worst-case scenarios and confidence-tiered judgement, though that episode also showed the risks of leaning too heavily on any single worst-case set¹¹. The shift was partial and crisis-driven, but it shows that integration is feasible, and for climate and nature crises we need not wait for an equivalent shock to implement changes.

Governments can build the capacity to integrate economic appraisal and security assessment despite their different epistemics. This may require the broadening of national security to encompass the ways environmental breakdown threatens how people live. It provides an opportunity for an integrative approach that can draw economic and risk assessments into a single picture, using the full apparatus of the state, rather than them contradicting one another and preventing action. Modelled insights alone, valuable as they are, will not surface these risks in time. Pairing modelling with the reasonable-worst-case methods that governments already trust in other domains would narrow the gap between the modelled world and the one risk assessors see coming.

Box 1: Two UK assessments of the same risk

In January 2026 the UK government published a national security assessment, *Global biodiversity loss, ecosystem collapse and national security*¹. Using intelligence-analysis methods, including an explicit reasonable-worst-case framing, it concludes with high confidence that global ecosystem degradation and collapse threaten UK security and prosperity, that the world is already seeing crop failures, intensified disasters, and disease outbreaks, and that "every critical ecosystem is on a pathway to collapse".

Outputs shaping UK climate, fiscal, and financial policy see that risk differently. The Climate Change Committee's Seventh Carbon Budget builds its Balanced Pathway from cost-effective, feasible options valued at Treasury Green Book costs rather than a risk assessment¹² (the Green Book gives users advice on and parameterisation of evaluation tools such as cost benefit analysis). The Office for Budget Responsibility, which advises Parliament on fiscal sustainability, draws its climate damage estimates from the Network for Greening the Financial System (NGFS) scenarios, putting UK GDP loss at ~3% for 2°C of global temperature rise, and ~5% for 3°C by the 2070s (while noting estimates exclude catastrophic risks)¹³.

NGFS scenarios are changing, with a revision of damage expectations sharply upwards to around 15% of global GDP by 2050 and 30% by 2100¹⁴, although these estimates remain unsettled as the study underpinning the damage function has been retracted and is under revision. Even at these higher damages, the NGFS states that ‘a global economic recession caused by climate change is not foreseen’¹⁴. These higher figures are still likely to understate risk, since they exclude impacts due to sea-level rise, tropical cyclones, tipping points, and non-market damage to ecosystems and human health, or their interactions; nor are the assumptions behind them, from climate sensitivity to the damage functions themselves, routinely produced or challenged independently¹⁵. Optimisation logic dominates the products reaching decision-makers, which generally present climate and nature risk as gradual and economically tractable.

Box 2: Three shifts toward integrated risk advice

First, present confidence-tiered expert judgement alongside model best-estimates, not point estimates alone, so that what current models omit stays in front of decision-makers rather than being relegated to appendices. An established family of methods including Robust Decision Making, Dynamic Adaptive Policy Pathways, and the broader field of decision-making under deep uncertainty was developed to identify policies that perform acceptably across many plausible futures rather than optimising for an expected one. These have been taken up in water, infrastructure, and disaster governance, but remain weakly integrated into climate-economic advice¹⁰.

Second, separate no-regret actions from those involving trade-offs and from high-stakes, irreversible commitments, and hold each to a different standard of evidence. No-regret measures such as energy efficiency, building retrofit, ecosystem restoration, and plant-rich diets are justified across almost any plausible future, because they cut emissions while reducing exposure to price and supply shocks and delivering near-term health and resilience gains. Trade-off decisions, such as accelerated nuclear new-build or large-scale bioenergy, carry both benefits and costs. Irreversible ones, such as heavy reliance on carbon dioxide removal that causes harm if scaled and poses systemic risk if it fails to scale, require caution.

Third, bring climate, nature, fiscal, health, food-system, and security risks into a shared framework, rather than separate channels. This means a common language of confidence, agreed reasonable-worst-case definitions and shared scenarios, so that risks identified in one department can be weighed against those in another rather than omitted. An important example is food-system policy that spans health, agriculture, trade, education, and security. Some governments are building capacity through whole-of-government risk registers, but this has yet to translate into shared methods for mitigation and adaptation decisions.

Competing interests

The authors declare the following competing interests: H.M. is founder and CEO of charity-funded non-profit Real Zero Ltd, which seeks to leverage the healthcare economy to drive

decarbonisation, and is unpaid chair of the UK Health Alliance on Climate Change. R.N. is a member of the UK Government's Climate Security Taskforce. The remaining authors declare no competing interests.

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