

are the ideal vehicle for productive field research¹⁸. Local communicators (particularly government officials) possess what researchers usually lack: an intimate knowledge of their communities, including the sorts of local influences that are deliberately stripped away in lab studies. Once apprised of the general mechanisms identified in such studies, these actors are best situated to form hypotheses about how to translate those general findings into determinate strategies suited for local conditions²³.

What decision scientists can usefully do at that point is collect more data. Using appropriately structured studies and appropriate samples, they can assess whether a candidate strategy is likely to achieve its goals. They can then do after-the-fact testing aimed at assessing whether the implemented strategy really worked.

In research funded by the Skoll Global Threats fund, for the last three and a half years the Cultural Cognition lab has been involved in exactly this form of partnership with Southeast Florida Climate Change Compact, a coalition of four county governments. Apprised of the landscape of findings from existing lab studies, the compact used a strategy that featured social proof — the tendency of people to conform their own behaviour to that of others whom they recognize as informed and socially competent²⁴. We supplied the member governments with highly realistic simulations of how members of different opinion-formation communities would react to compact-supportive individuals from across

the region's multiple cultural communities. Such individuals help to breed public support by example rather than argument: their actions and deeds conveyed that they trusted the science that informed the compact's ambitious agenda¹⁰. We then prepared follow-up studies, again exposing members of the public to information from such sources, to help the compact assess the success of this approach for engaging the public.

We take no credit for the success of the compact. Its members identified the hypotheses of interest and made practical judgments in interpreting results. But after three and a half years of evidence-informed practice, their climate communications have achieved an enviable record of success notwithstanding the intense degree of political polarization in their region.

The lab-field shuttle

Lab studies will never completely lose their value. Under ideal conditions, there would be a reciprocal relationship in which lab-derived insights would be used to drive field research, which in turn would expose new questions about mechanisms, the investigation of which would require more lab studies. However, there comes a time when we know enough about general mechanisms to start the independent process of adapting those mechanisms to real-world situations. That time is now. More researchers need to be venturing forth from the lab and into the field to test hypotheses about how results observed in the former can guide decisions in the latter. □

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COMMENTARY:

The IPCC and the politics of anticipation

Silke Beck and Martin Mahony

In the emerging post-Paris climate governance regime, the role of scientific expertise is radically changing. The IPCC in particular may find itself in a new role, where projections of future climate function as a kind of regulatory science. This poses great challenges to conventional ideals of scientific neutrality.

Following the Paris Agreement of December 2015, the head of the Intergovernmental Panel on Climate Change (IPCC) announced a new direction for the panel's assessments, moving from

the attribution of causes and the detection of impacts towards solutions to address climate change¹. The adoption of the Paris Agreement, which sets a long-term goal of holding global warming to well below 2 °C

above pre-industrial levels, also provides motivation for scientists to explore pathways compatible with 1.5 °C of warming. Climate governance is being increasingly organized around these pathways. Previously, scenarios

of future climate change served either as futures to avoid or to aspire to. Now, pathways are used as benchmarks against which extant policies can be measured and evaluated, and with which a climate governance regime can plot a quantified route forward to meet certain climate targets. Consequently, climate science is being asked not to simply act as a Cassandra, warning of future catastrophes, but to furnish policymakers with 'regulatory science' and to anticipate and measure the performance of policies in the future. This trend is evident in the IPCC special report that has been commissioned to consider ways of meeting the 1.5 °C target.

Here, we suggest that the development and use of pathways creates new politics of anticipation, wherein potentially contestable choices for climate futures are woven into the technical elaboration of alternative pathways. We argue that the growing political demand for pathways and their political significance requires rethinking modes of assessment that go beyond expert-driven neutral input. Instead, assessment must take into account political context and implications in a systematic way.

The impacts of pathways

The development of IPCC scenario methodologies illustrates the political role of pathways in climate policymaking. Following the IPCC's Fourth Assessment Report in 2007, a new generation of emissions scenarios was developed to inform both climate simulations and impact assessments. New Representative Concentration Pathways (RCPs) were not meant to be predictions of particular social and technical futures, but rather heuristics to inform the independent evaluation of different climate policy options. RCP2.6, in particular, was a product of co-production between scientists and European Union policymakers, the latter being keen on pathways which showed the technical feasibility of 2 °C (ref. 2). RCP2.6 relied heavily on negative emissions technologies (NETs) to reach that target. However, commentators have subsequently argued that wide-ranging implications of NETs were not communicated to policymakers along with the pathways themselves³. RCP2.6 held huge political significance in the run-up to the Paris talks as it showed that the 2 °C target was still feasible. RCP2.6 therefore quickly became a fact that mattered. The Paris Agreement to hold global temperature rise to well below 2 °C was informed by this buttressed sense of technical feasibility, creating a slippery slope from a possible pathway to a political reality — the pathway informed and justified political aspirations to a certain end (the 2 °C target), while also becoming a policy option in terms of both ends and



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means, thereby bringing new things — like bioenergy with carbon capture and storage (BECCS) — firmly into political debate. In this way, RCP2.6 was performative: pathways and scenarios do not just represent possible futures, but also help to bring certain futures into being.

Thus, the RCP2.6 example demonstrates that the development of pathways is not simply about assessing scientific facts about the causes and trajectories of climate change. Pathways are political interventions that can define the freedom of action and spectrum of choices in the future by determining the often-irreversible path of developments. It has been suggested by leading experts, such as Lord Stern, that there are no alternatives to BECCS and there is no time to deliberate their use in a democratic way⁴. Others, however, have argued that there are huge opportunities for rapid and deep emissions reductions in the near term which have largely been absent from recent policy debates⁵. Could targets, like 1.5 °C, and the pathways that suggest their technical feasibility, be used to legitimize the deployment of technologies without broader societal assent, and without democratic discussion of alternatives?

If so, what does this mean for the conduct of scientific assessment? Oliver Geden⁶ and others⁷ have described the positioning of BECCS in RCP2.6, and the failure to adequately explain its implications to policymakers, as a failure of scientific advice and assessment. While BECCS may help us achieve 2 °C targets, it would involve massive displacements of land and people, with global implications for food supply, land rights, and environmental justice⁸. Indeed, resistance to emerging BECCS strategies is beginning to mobilize⁹.

The IPCC, in its current configuration, can do little more than treat options such as BECCS as questions of technical feasibility. There is an agreement that climate policies have to be based on sound forecasts of climate futures. But must the soundness of these forecasts be based only in questions of technical feasibility and global economic optimality? We suggest that forecasters themselves should be asked to anticipate the political impacts of their forecasts.

The challenges ahead

New notions of responsible research and innovation have recently emerged as scholars have sought new ways of accounting for the politics of knowledge and anticipation. Their *leitmotiv* is that because anticipation is performative, there can be no sidestepping the responsibility of knowledge-makers to engage with the consequences of their work^{10,11}. The idea of responsibility here is not legalistic and retrospective, but prospective, recognizing profound uncertainties and encouraging and supporting researchers to join intellectual forces to explore them. At least since World War II, recognition of the power of science has forced reconsideration of its responsibilities. These discussions not only reignite an older debate about scientific autonomy but also offer new opportunities to rethink the role of science in society¹².

How can insights from these debates inform the discussion about the IPCC's future role in climate policymaking in a complementary and constructive way? First, we need to ask whether the IPCC helps hasten into being the futures it describes — does the significant presence of BECCS in RCP2.6, and the political significance of RCP2.6, make a BECCS-inflected future more likely? If so, questions about societal values and political feasibility need to be engaged with earlier in the scenario-production and assessment process.

Second, anticipation implies an awareness of the importance of richly imagining socio-technical alternatives. As Parker and Geden¹³ have recently argued, there is an opportunity for the IPCC to maintain its policy-relevance by starting a critical conversation about policy alternatives, which in turn can inform controversial (but necessary) deliberation about the balance of global policy emphasis between mitigation, adaptation, carbon dioxide removal, and solar radiation management. The IPCC could open up consideration of alternative technological possibilities, of future pathways of climate policies, and alternatives to current policy orthodoxies. Such openness could help to improve scientific understanding of and solutions to these complex problems, as well as address challenges such as uncertainty

and ignorance. This openness also invites a broader range of academic disciplines to contribute to exploring more flexible, more inclusive, and, arguably, more effective approaches to societal transformation¹⁴.

By organizing solution-oriented assessment not just around different RCPs and inferred technologies but around different pathways of societal transformation, the IPCC can play a key role in facilitating dialogue about policy alternatives and their political implications. The IPCC is an incredibly powerful actor in climate politics. It is an important player in making futures, not just forecasting them — a role likely to intensify in a new solution-oriented mode. By taking responsibility for this role, the IPCC

can continue to exercise its political power wisely, by keeping the possibility space of political action open for negotiation among a diversity of actors and options. □

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