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Anticipating climate futures in a 1.5 °C era: the link between foresight and governance

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The Paris Agreement's aspirational 1.5 degree temperature target has given further impetus to efforts to imagine (and seek to govern) transformative and uncertain climate futures. This brings to the fore multiple challenges in the search for *anticipatory* governance and the role herein for climate foresight. Foresight entails processes to envision challenging futures and question limiting assumptions about what futures are possible, but these processes also impact upon present-day politics. While foresight-related activities are proliferating in sustainability research and planning, critical social science scrutiny of such processes remains minimal. Two key gaps in understanding are: (a) the link between foresight, planning and policy change; and (b) the very prospects of relying on foresight *in the present* to steer largely unknowable futures. In addressing these gaps, we review the field of climate foresight research here, situating it within a broader interdisciplinary body of literature relating to anticipation and anticipatory governance. In doing so, we identify a conceptual lens through which to analyze the political implications of foresight processes, and apply it to the case of two ongoing foresight initiatives. We conclude with noting the urgent need for further research on the role of foresight within anticipatory climate governance in a post-Paris era.

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Introduction

In light of the Paris Agreement's aspirational goal to hold global average temperature increases to 1.5 °C by the end of the century, mechanisms and processes by which to *imagine and govern diverse climate futures* are increasingly coming to the forefront of sustainability debates and practice. These include action-oriented *climate foresight processes*, that is, approaches that aim to imagine and pre-experience challenging futures, to question limiting assumptions about what futures may be possible, and to experiment with strategies for transformational changes assumed to be necessary for the achievement of sustainability targets [1,2]. There has been a proliferation of foresight processes in sustainability-related research and planning contexts, with most foresight approaches focusing on the use of alternative scenarios to explore future directions of multiple drivers of change. However, social science scrutiny of such processes has been minimal. Studies of foresight that are rooted in the environmental sciences, macro-economics, land use change and business planning, for example, remain largely disconnected from environmental policy and governance research [3–7].

Our review addresses this gap. We explore how ongoing processes of foresight are related to *anticipatory* climate governance, understood most broadly to mean the evolution of steering mechanisms in the present to adapt to and/or shape uncertain climate futures. Seeking to shape an unknown and largely unknowable future is fraught with normative and scientific uncertainties and conflicts [8,9••]. This signals the timeliness of an emerging interdisciplinary research agenda: to explore diverse perspectives on the very prospects of anticipating and governing largely unknowable futures and the role of foresight herein.

We proceed as follows: section 'Anticipatory governance of climate futures: what, how and why' briefly reviews diverse understandings of anticipatory governance, including their conceptualizations of the future. Section 'Foresight in anticipating climate futures: the link to governance' explores diverse perspectives on the role of foresight in policy processes and imagining (and potentially shaping) future outcomes. We conclude this section by distilling a set of questions to facilitate further analysis of the link between foresight and anticipatory governance. In section 'Links between foresight, governance and policy choices: lessons from practice', we then briefly explore the relevance of these questions in the case of two foresight processes currently underway that seek, to

greater or lesser extent, to spur transformative future changes. This brief empirical examination allows us to explore whether and how foresight can, in practice, not only help to imagine but also shape policy choices in the present. We conclude with outlining a research agenda to further explore the role of foresight within anticipatory climate governance, given proliferating efforts to imagine and realize diverse 1.5 °C climate futures in a post-Paris era.

Anticipatory governance of climate futures: what, how and why

Numerous academic communities have addressed various dimensions of anticipatory governance in the last decades, including scholars of science studies and the sociology of science [10,11,12•,13••,14], sociology of the future [15,16••], risk governance [17•], anticipatory technology assessment and/or responsible research and innovation [18–21], adaptive governance and resilience [22•,23] and anticipation as a field in its own right [24]. Yet the notion is understood within these communities in different ways. In particular, perspectives on anticipation and anticipatory governance vary in their conceptions of the future, including the extent to which the future is knowable and subject to steering.

An array of possibilities presents itself: is the future predictable and controllable? Or wholly unpredictable? Or uncertain but navigable? In articulating specific conceptions of the future, Feurth and Faber, for example, equate anticipatory governance with creating 'a structure for information collection and analysis that is long-ranged, strategic, mission-focused, holistic and connected to policy making that gets us ahead of events' [24]. In this view, there is a clear link between anticipation and policy planning, with anticipatory governance associated with the creation of 'a feedback system to constantly measure consequences against expectations as a way to learn from experience and refresh policy'. The purpose here is to stay *one step ahead of the present*, with the authors noting that 'we must get ahead of events or we risk being overtaken by them' [25,43]. This suggests a specific conceptualization of how anticipatory processes can aid in future-oriented policy planning, one that differs from that offered by more critical perspectives. Nordmann [9••:32], for example, highlights the risks of focusing on anticipating the future to the detriment of attending to present needs and dilemmas, that is, the risk, as he sees it, that 'an imagined future overwhelms the present'. In this view, while anticipation may well be akin to preparedness, it cannot be equated with knowing the future in anything more than a superficial sense, given the inherent unknowability of the content of future worlds. This highlights the saliency of considering the political implications *in the present* of what Jasanoff calls 'fabrications of the future' [13••:337] or 'sociotechnical imaginaries', that is, 'collectively held, institutionally stabilized, and publicly performed visions of desirable futures' co-produced with advances in science and technology [13••:6]. A critical strand of futures research similarly highlights the political implications of varied (shared or contested) visions of the future. De Wilde [26] notes, for example, how visions of a 'beckoning' (promising) versus an 'onrushing' (menacing) future constrain and condition present possibilities, shaping present-day regulatory, resource allocation and other societal choices (see also Jansen and Gupta [12•]).

If so, what role does foresight play in such visions of the future? And how is the link between foresight and *governing* varied futures being articulated within foresight scholarship and practice? This remains a very salient question. As Garb, Pulver and Vandeveer stated almost a decade ago, 'grappling with a future whose anticipation is a massively complex and nigh impossible task should not be an excuse for ceding clear analytic examination of the scenario process. In particular, the study of the 'softer' parts of the scenario production process, such as the social production of storylines and their interactions with models, and questions of scenario circulation and reception, have not received adequate attention or resources' [27••:7]. This call is also reflected in another influential perspective on anticipatory governance in the context of responsible research and innovation, one that also draws attention to the role of scenario and foresight processes. As David Guston understands it, anticipatory governance is 'a broad-based capacity extended through society that can act on a variety of inputs to manage emerging knowledge-based technologies while such management is still possible'. Anticipation and anticipatory governance is fundamentally related here to the notion of *capacities* rather than to knowable or predictable futures, with anticipation seen as 'practicing, rehearsing, or exercising a capacity . . . [rather than] divining a future' [28••:226]. Importantly, key elements of building such capacities include foresight and scenario building.

Drawing on our brief review above, we see a clear need for foresight to be (re-) conceptualized as a site wherein the politics of imagining and anticipating the future can be analyzed. The key concern for us is not so much the *speculative* nature of claims about an unknowable future (we take that as a given), but rather the specific content of speculative future-related claims, including future sense-making as it manifests via foresight and scenario exercises. An important aspect we focus on is the link between imaginary futures and political choices in the present. We turn next to how scholarly literature and practices on foresight has engaged (or not) with this aspect.

Foresight in anticipating climate futures: the link to governance

In the face of climate change and global pressures on the environment, governments and other actors are

increasingly looking to foresight to help imagine and experiment with potential future climate conditions, and their interactions with other (economic, political, socio-cultural) uncertainties [29]. Developing countries that are highly vulnerable to climate change are also increasingly seeking to use foresight studies to guide their adaptation and mitigation planning, both in dedicated climate policies and plans, and in other sectoral planning [30••]. The Paris Agreement and its aspirational aim to restrict temperature increases to 1.5 °C gives increased impetus to such foresight processes. Equally, country commitments to consider future climate actions in the context of updating Nationally Determined Contributions (NDCs) require imagining future transformative pathways [31].

In both scholarly analyses and policy practice, much progress has been made in developing foresight approaches to address sustainability challenges, leading to strong insights on scenario characteristics [32], the integration of qualitative and quantitative scenarios [33–35], the integration of scenarios across scales [36–41], novel ways of constructing scenario frameworks [42], combining analytical and experiential scenario approaches [43], and reflexive societal participation [44••,45]. The global community of climate, emissions and integrated assessment researchers has developed a new set of climate and socio-economic scenarios that aim to function as a set of global reference contexts [46,47].

What is the connection, however, between such foresight processes and policy formulation and policy choices? All planning processes are future-oriented by definition. Because of this, assumptions about potential futures are always made in planning processes, and they define strategic directions and proposed actions. Sense-making about the future frames and shapes decision-making processes [48]. This framing happens even if assumptions about the future in such processes are largely left implicit and unacknowledged, if the future is considered to be more or less like the present, or if only one potential future is considered possible [45]. If so, foresight processes can be seen as attempts, however incomplete, at more explicit, structured, reflexive sense-making about the future.

Those leading foresight processes make assumptions about the above aspects of the future, sometimes implicitly, and sometimes explicitly. Different approaches and examples vary wildly in how they understand links between potential futures and present action. They may range from reflexivity about the political aspects of futures to a relative lack of awareness. Foresight processes have historically ranged from seeing the future as uncertain within controllable boundaries of likelihood, to perspectives based in complex systems thinking and social constructivism that see the future as more fundamentally uncertain, but nevertheless navigable [49•]. Foresight approaches do not consistently engage explicitly with ideas about contextual social imaginaries, but many aim to facilitate breaking out of commonly imagined futures, toward 'thinking the unthinkable' [50].

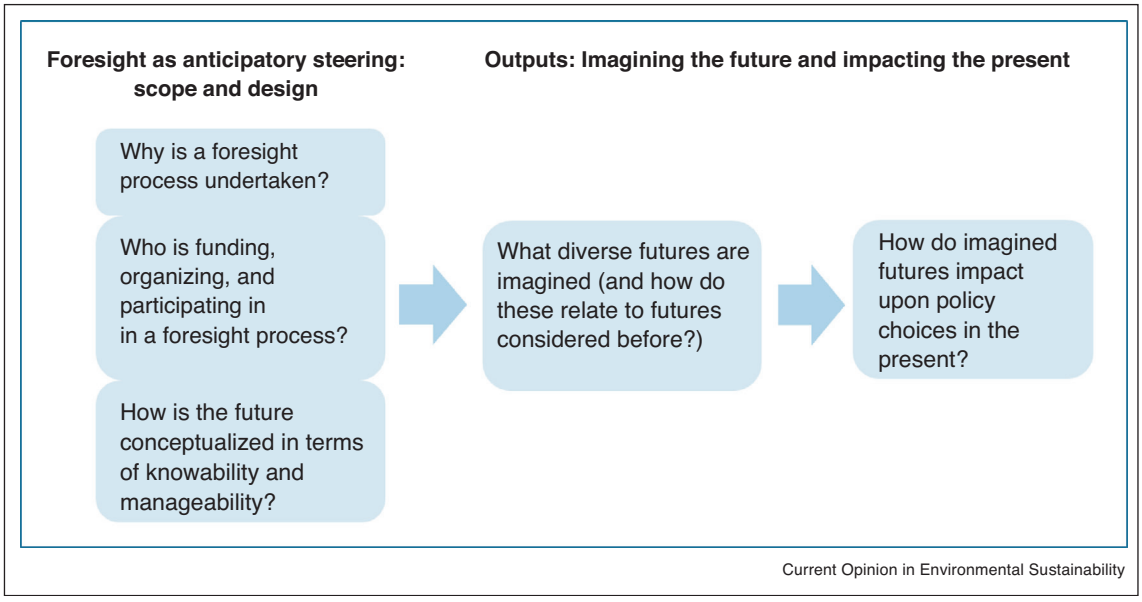
Generally, however, current foresight practices exhibit a lack of sustained engagement with the question of how and why foresight is integrated into environmental governance, policy and planning processes. Foresight processes might be initiated by actors who are disconnected from decision-makers in governments, the private sector or civil society. While decision-makers may participate in such foresight processes, integration between foresight and specific planning processes is not part of the mandate, the interest or the experience of many foresight organizers [2]. Alternatively, foresight exercises might be encouraged by policy makers for various reasons — to make policy less focused on power politics and more problem-oriented [51] or, as critics of technocratic foresight approaches allege, as a means to deflect urgent and politically contested decisions and actions on climate mitigation and adaptation [52].

This suggests a need to re-conceptualize and operationalize foresight as going beyond an expert-driven neutral input into improved climate policy and decision-making. The future is an open space, but not a politically neutral one, with many actors projecting their interests onto it [45,53]. Seen from a critical social science perspective, foresight is likely to constitute thus a site of politics and governance in and of itself, wherein potentially contested, alternative versions of climate futures are imagined, negotiated, used and/or ignored in the scenario development process and by key policy actors. If so, the design of more democratic foresight processes also comes to the fore as a key challenge [54].

In sum, our brief review above suggests a need to evaluate foresight in terms of the agents, aims and processes involved, as well as its political contexts and implications. An integrated research agenda requires, in our view, analyzing how foresight processes are being governed, that is, who is steering them, to what end, and through what deliberative or representative processes. It is also important to consider how foresight itself is a political intervention, that is, how processes of foresight might exercise specific governance effects [13••]. Finally, it is important to analyze the kinds of futures imagined within these processes, and how these might impact upon present-day political choices.

We distill these elements in Figure 1, which synthesizes key questions to guide further research into foresight and its role in anticipatory governance. These questions include:

Figure 1



Foresight as anticipatory steering: imagining the future and impacting the present?
Source: Authors.

1. **Why** is a foresight exercise undertaken? What are its aims and desired outcomes [44••]?
2. **Who** is involved in a foresight process? Who commissions, initiates and participates in foresight processes, and how are participants identified and selected? What dynamics of representation and inclusion and exclusion are discernible [58]?
3. **How** is the future conceptualized in a given foresight process, in terms of its knowability and manageability? How uncertain is the future considered to be? What is the perceived relationship between the future and the present [49•]?
4. **What** diverse futures are imagined? What futures are seen as 'plausible' [43,45]?
5. How do the futures imagined in the foresight process **impact the present**, in terms of decision-making and policy choices [27••]?

Figure 1 thus synthesizes an analytical framework with which to investigate how foresight processes imagine and seek to shape the future, and in so doing, how they impact upon the present. This is especially timely in light of the ongoing and accelerating attempts to imagine diverse climate futures required to achieve 1.5 degree scenarios; and given the growing use of foresight in the world's most vulnerable regions of the Global South, where they are increasingly prevalent but least analyzed [55–57].

We next briefly apply this analytical framework to two ongoing foresight initiatives before concluding with lessons learned and implications for further research.

Links between foresight, governance and policy choices: lessons from practice

The two ongoing foresight processes we examine here include, first, the Scenarios Project of the Climate Change, Agriculture and Food Security (CCAFS) program, which develops scenarios for national policy development in the context of climate mitigation and adaptation across seven global regions [29,30••]. The second is Transmango, a European Commission funded program on sustainable food futures in Europe and Africa in the context of global change, which aims to identify and develop alternative more radical transition pathways to sustainable food and nutrition systems [58,59], through scenarios. Both are processes that the authors have been involved with and both have sought to be somewhat more reflexive about the 'why, who, how, and what' questions we raise in our analytical framework, allowing us to assess whether lessons can be learned for other foresight processes.

Why is a foresight process undertaken?

The CCAFS Scenarios Project aims to reduce emissions and increase food and nutrition security by investigating options for feasible national policies, through developing challenging future scenarios. The aim is also to open up the policy development process to various stakeholders, including those affected by these policies or those who

might be instrumental to achieving them. The Transmango project uses foresight to (1) support the strategic planning of high-potential niche practices and social innovators that are currently operating in the margins of food and sustainability debates and developments in Europe; and (2) to enrich European Union-level policy dialogues about the future of food in Europe, particularly to go beyond current perspectives that are mostly focused on large-scale agricultural production.

Who is funding, organizing and participating in foresight?

Both projects are led by a consortium of researchers. The CCAFS Scenarios Project is funded by a range of development funders, including the European Union (EU) and national governments, with a strong development mandate that requires identifiable and timely policy impact. In the CCAFS Scenarios Project, a range of societal stakeholders are involved in participatory scenario development processes, including those who would normally not have access to policy formulation. However, the main participants are still national governments. By contrast, Transmango has been funded by EU research funding, and thus its main mandate is to produce cutting edge research. Engagement with societal actors in this project has therefore been driven by research considerations. The focus of this project is on identifying niche practices to contribute to European food futures. As such, engagements have been primarily with actors in niche food practices, as well as with European level policy makers.

How is the future conceptualized in terms of knowability and manageability?

Scrutinizing the scope, aims and participants in each scenario exercise also allows us to ascertain the conception of the future embedded within each, an aspect that often remains implicit rather than being (made) explicit in most scenario exercises, and hence also little researched. In the CCAFS Scenarios Project, many of the main process partners are policy makers trained in a positivist planning mindset. For this set of actors, the future is mostly something to anticipate and prepare for in the present — the emphasis is on 'future-proofing' policies. The CCAFS foresight process has sought to open this up to a greater acknowledgement of, and engagement with, future uncertainties and possibilities through the scenario building process — seeing the future as less knowable but then focusing on how to navigate this future uncertainty. In the Transmango project, where participants in the project's foresight processes are individuals who are operating in niche food innovation initiatives, the perspective that the future is uncertain is more common, but perceptions of navigability vary. In this project, the future is conceptualized as a space wherein pathways to desired worlds are imagined, after which the first steps in the present can be taken toward these desired futures. Thus, in this project, the future is acknowledged as uncertain, and ideas about manageability are expressed in terms of finding possibilities for transformative change.

What diverse futures are imagined?

In both foresight processes, a conscious effort has been made to break away from future frames in which agronomy and agricultural economics dominate, in order to imagine futures that focus on wider food system and sustainability dynamics and socio-economic concerns. In both initiatives, the reliance on multi-dimensional scenario approaches [40] have allowed for the inclusion of a range of social, economic, environmental, cultural and political drivers in the same scenario set, making regional scenarios more adaptable to different national concerns in the case of the CCAFS Scenarios Project [35] and open to social innovation in the case of Transmango [59,60]. In the CCAFS process, the scenarios allow for consideration of new challenges and risks in the realm of climate adaptation and sustainability transformations beyond those previously imagined, while in the Transmango process, newly imagined futures, emerging from local niche innovators, seek to add to the broader repository of desirable futures that could be conceptualized (and sought) at the EU policy level.

How do the futures imagined in the foresight process impact policy choices?

The CCAFS project engages with the national level, where there is a clear demand for structured investigations of policy options. Foresight processes are designed to be integrated with ongoing processes of policy and strategy development. This means that the loop from imagined futures to present impact is intended to be short: new futures are imagined, and then immediately used to test in-progress government policies and plans in order to ensure robustness in the face of future uncertainty [30••,35]. In the Transmango project, local niche innovators also use newly created futures to affect their policy choices. At the European policy level, however, the focus is primarily on shaping what spectrum of futures can be considered when exploring the future of food in Europe — with less of a tight loop from these imagined futures to specific policy choices in the present. In comparing these two approaches, the benefits of a tight loop from imagined futures to specific present-day policy choices lie in the immediate and demonstrable impact of the foresight process on policy. By contrast, the impacts of shaping wider dialogues about the future across different policy domains may be longer-term and harder to track, but more widespread and systemic.

Our brief discussion above provides some hints that foresight processes are inherently political, not just in terms of the objectives of their funders, but also with regard to the use of foresight as a way to involve new actors in decision-making, create awareness about government strategies, gain credibility for policy choices

through use of expert, science-based scenario building exercises and/or support niche innovation [52]. How the future is conceptualized in terms of knowability and manageability also has implications for the diversity of futures imagined and their impact on present-day policy choices. Seeing the future as something to be adapted to (CCAFS scenarios) versus something to be transformed (Transmango), for example, has consequences for all elements of a foresight process and its impacts on the present. Furthermore, in the face of uncertain futures, many foresight processes, including the ones we examine above, acknowledge that diverse perspectives on alternative futures are valid and needed. Our discussion suggests that foresight processes that do succeed in creating more inclusive planning processes can lead to pluralistic imaginings of 'what' futures are considered [45], with impacts on present-day political and policy choices.

Conclusion: linking foresight and governance in a 1.5 °C era

We have sought in this review to apply an integrated social science lens to assessing whether and how foresight processes imagine diverse futures, and in so doing, impact upon the present. We have discussed the merits of inclusive processes that are able to imagine more pluralistic, diverse futures that may well aid in prioritization amongst difficult present-day choices. It is also important, however, to consider a variety of other alternative outcomes flowing from foresight processes: including, for example, that they remain novel 'thought experiments' that are politically benign; or else even *distract* from difficult policy choices in the present; or serve to steer policy choices in a direction that excludes certain societal priorities.

Opening up such a research agenda is particularly timely in light of proliferating foresight processes relating to the aspirational Paris Agreement 1.5 °C target [61•]. These have tended to remain mainly desk studies and simulation modelling conducted by researchers, without participatory components [62,63], even though they have the ambition to inform policy. Many national–national and sub-national level foresight studies also often lack broad participatory elements, although these have stronger links to policy objectives [64–69]. In light of these existing experiences and the state of current understanding about the links between foresight and anticipatory climate governance, the time is now ripe, in our view, to further explore the political context and implications of seeking to integrate foresight into ongoing policy planning, including analysis of who participates in these processes. The continuing need to understand the nature, context and implications of politically salient foresight processes, and their contribution to imagining diverse climate futures while shaping present-day politics, appears to us to be very high indeed.

Conflict of interest

None.

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