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Climate Fiction as Future-Making: Narrative and Cultural Modelling Beyond Representation

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ABSTRACT

Climate fiction (cli-fi) increasingly attracts the attention of wider publics and expert science communities. And yet, critiques of its limits and the limits of its efficiency as a tool of persuading broader readerships are also becoming more frequent. This article draws on such critiques and discussions of the limits of representing climate change and related crises. We argue that, first, a focus on the representational capacity of fiction occludes other, equally important, functions of fiction. Second, we aver that such a focus insufficiently reflects on its own didactic bias that leads critics to endorse or even instrumentalize literary narrative for the seemingly obvious good cause of educating or mobilizing readers. The article suggests shifting the focus from mere issues of representation to questions of the effect and impact of reading in the wider conceptual context of climate imaginaries, defined as a shared set of beliefs, practices and norms, that define the scope of individual and collective future-thinking. It aims to develop a better understanding of the potential links between future-making and fiction and employs insights from model theory and theories and practices of (climate) modelling—the dominant, authoritative form of future-making in many disciplines, especially the natural sciences—to propose that cli-fi can be seen as an important alternative future-making tool when it is recognized as a form of cultural modelling. This allows us to acknowledge that cli-fi is a future-making technology directly impacting climate imaginaries, as the article will show through exemplary readings of two case studies, Jessie Greengrass's novel *The High House* (2021) and Rory Mullarkey's play *Flood* (premiered 2018).

1 | Introduction

As climate fiction (cli-fi) continues to evolve and increasingly attracts the attention of wider publics and expert science communities (Rong 2023), critiques of its limits and the limits of its efficiency as a tool of persuading broader readerships are also becoming more frequent (Hoydis et al. 2023; Schneider-Mayerson et al. 2020; Maczynska 2023). This article draws on such critiques and links current (Ghosh 2016; Nixon 2011) and previous (Head 1998; Rigby 2004) discussions of the limits of representing the 'slow violence' (Nixon) of climate change and related crises. We argue that, first, a focus on the representational capacity of fiction occludes other, equally important, functions of fiction. Second, we aver that such a focus insufficiently reflects on

its own didactic bias that leads critics to endorse or even instrumentalize literary narrative for the seemingly obvious good cause of educating or mobilizing readers.

The article, therefore, suggests shifting the focus from mere issues of representation to questions of the effect and impact of reading in the wider conceptual context of climate imaginaries, defined as shared sets of beliefs, practices and norms, that define the scope of individual and collective future-thinking (Hulme 2022). While such questions are prominent in, for instance, research in empirical ecocriticism (Schneider-Mayerson et al. 2023), we argue that they are insufficiently grounded in theoretical and conceptual research on fiction as a future-making technology. This article, therefore, aims to develop a better understanding of the potential links

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between future-making and fiction. It employs insights from model theory and theories and practices of (climate) modelling—the dominant, authoritative form of future-making in many disciplines, especially the natural sciences (see Hulme 2012)—to propose that cli-fi can be seen as an important alternative future-making tool when it is recognized as a form of cultural modelling. This allows us to acknowledge that cli-fi is a future-making technology directly impacting on climate imaginaries, as the article will show through exemplary readings of two case studies, Jessie Greengrass's novel *The High House* (2021) and Rory Mullarkey's play *Flood* (2022). Since climate imaginaries are unobservable for the climate sciences, the role of fiction as a future-making technique is crucial, especially when it meaningfully and productively engages questions of value as well as extreme cases of future scenarios (Davidson and Kemp 2023). Focussing on a key issue in ethical debates of climate futures, the article explores intergenerational (in)justice as an exemplary case of the connection between values and extreme future scenarios. But, by developing a wider argument for the importance of climate imaginaries more generally, it makes a case for the applicability of such a functional understanding of (climate) fiction to the more general challenge of including norms and values in the debate of modelling climate-changed futures.

2 | The Limits of Representation

The burgeoning debate around cli-fi and an increasing awareness of global environmental (in-)justice and its violent manifestations—especially but not only in the Global South—has recently fuelled the discussion of the importance of literary narrative in the context of the ethical and epistemological challenges associated with climate change. This discussion entails an interrogation of the potentials and limitations of fictional representations of environmental harms leading to undesirable futures and grave injustices. And while calls for the inclusion of storytelling from the climate sciences are a relatively recent phenomenon (Shepherd et al. 2018), the environmental humanities have for a long time been arguing for this potential of fiction and engaged with questions of the limits of literary representation. In 1998, already, eminent ecocritic Dominic Head published an influential essay on the '(Im)Possibility of Ecocriticism', pointing to the historical context of the modern (realist) novel that, in his estimation, renders it complicit with current environmental crises. This, he argues, explains its incapability to 'ruminate usefully on the route to the post-industrial world' (Head 1998, 32). What follows from this observation, shared by many ecocritics in subsequent years, is the need of ecocriticism to broaden its geographical scope to include narratives from the Global South, and to better account for form, rather than content or representation (e.g., Bartosch 2012; James 2015). In a similar vein, Kate Rigby challenged the ecocritical desire for nonanthropocentric writing and, thus, a form of representation that would accommodate the more-than-human. She suggested conceiving of literature – or, in her account, 'poiesis'—'as a response' and a 'calling' to perceive and attend to the complex enmeshments of humans and other earthly beings (2004, 438, 440). Notably, both scholars focus on form and reception processes as potential countermeasures to the mere stocktaking of representations, more recently also and especially in conversation with decolonial and indigenous voices and works (Rigby 2015).

In the context of climate change, which 'belatedly emerged as a central concern of ecocriticism in the 2010s', as Greg Garrard (2023, 109) claims, a general concern with representation persisted in mainstream ecocriticism, while the attention to forms and functions of writing and of reception was relegated to the background in favour of more conceptual discussions of the complexity and 'unnarratability' of the phenomenon (Berghaller n.d.; see also Clark 2015). Moreover, research explicitly engaging with issues of justice and representation in postcolonial and Global South contexts has underlined the specific representational challenges of 'slow violence' (Nixon 2011), that is, 'a violence that occurs gradually and out of sight, a violence of delayed destruction that is dispersed across time and space, an attritional violence that is typically not viewed as violence at all' (2). In this context, famously, Amitav Ghosh has critiqued the generic limitations of established forms of literary writing such as the Western realist novel in his unequivocally titled book *The Great Derangement* (Ghosh 2016). Ghosh's critique sparked renewed engagement with the forms, genres and realism(s) of fictional representations of climate change (Hoydis 2024 and forthcoming; Johns-Putra 2019; LeMenanger 2017; Levine 2023).

We agree that a broader and transmedial view is required that does not limit its focus to Western realist fiction. At the same time, we are conscious of a persisting general concern with representation that comes at the expense of engagements with theoretical work on climate imaginaries and future-making in which fiction ought to be situated and that would help to redress some of the shortcomings of linking representation with readerly impact. If, as Timothy Clark maintains, ecocriticism has gradually turned into 'a leading forum for thought on the nature and limits of the novel as a literary form' (2019, 78), the larger forum of the environmental humanities might meaningfully engage the limits of representation, alongside its instrumentalist and didactic logic of equating the representation of something or someone with desirable epistemic, normative and societal impacts (Phillips 2003; Goodbody 2020). This would allow to see more comprehensive theoretical as well as empirical accounts of literary narrative in the environmental humanities (e.g., Zapf 2016; Schneider-Mayerson et al. 2023) and critiques of the instrumentalization of fiction for the good cause (Hoydis et al. 2023) as elements of the ongoing interrogation of the effects of fiction. So far, this otherwise crucial and fruitful debate has not produced a systematic account of the connection between literary form(s) and forms of reception within the context of practices of future-making. Such an account would be needed, however, for scholars seeking to better understand, and subsequently make a case for, the importance of (climate) fiction in current and future crises.

3 | Cultural Modelling as an Alternative Approach

We seek to provide a first conceptual step toward such an account, which would be beyond the purview of a single article, by highlighting the future-making capacities of (climate) fiction. For this, we understand engagements with cli-fi as a form of cultural modelling of climate futures that needs to be analyzed by paying equal attention to literary form(s) and ways of readerly engagement beyond the simplistic logic of representation and expected effects. While readerly engagements can only be speculated about in a theoretical contribution, we are providing a comparative perspective

on the matter of form by including dramatic text written for performance. In both the prose and dramatic texts, intergenerational justice and catastrophic climate futures constitute key concerns and thus qualify our choice for examples of 'extreme cases' (Davidson and Kemp 2023). In prose cli-fi, these concerns are well-documented, but they are also emerging as a key issue in contemporary drama (see Balestrini 2020; Freestone and O'Hare 2023; Hoydis 2023). Our turn to the concept of modelling and to theories associated with that terminology and practice is motivated by several reasons.¹ First and foremost, it allows for a crucial shift of attention from looking only at represented—*modelled*—diegetic worlds to various forms of (narrative, cognitive, affective, and eventually, behavioural) *modelling* in wider reader and media ecologies (Bruhn and Salmose 2023). It thus enables us to address both the critiques of representation and its didactic bias, mentioned above. Instead of scrutinizing representations, extrapolating their effect and subscribing to a literary didacticism that instrumentalizes fiction's representational potential in the hope of engaging readers and moving them into climate action, we hold that literature's potential is better understood when conceived as individual and collective future-making.

Looking at models and modelling practices is justified also because of the key role models and modelling play in the current debate on climate change. As the dangers and impacts of climate change are felt with ever greater frequency and severity, uncertainty about future developments of both the climate system and of societal responses to climatic change increases. This has turned climate models into a principal tool for future-making (Hulme 2012, 2023). Critiques of the dominance of this specific future-making technique over other forms of futuring revolve around the discussion of inevitable blind spots in quantitative and mathematical modelling procedures (Thompson 2022), its lack of imagination when it comes to making 'connections across all the traditional silos of knowledge' and the still enduring belief extant models only need to be improved technically (Stainforth 2023, 47, 143). What is more, scientific modelling to this day remains unable to understand the human and cultural dimensions of environmental change and its dynamic interrelationship with societies, despite advances in, for instance, transitions and agent-based modelling (Moallemi and de Haan 2020). This is particularly true for extreme-case scenarios, compound hazards, and risk cascades as well as 'maladaptive societal responses' (Davidson and Kemp 2023, 4).

We believe that a dialogue between scientific forms of modelling and emerging complementary work in the environmental humanities can benefit from a closer inspection of research on model theory. In the work of mathematician Bernd Mahr, for instance, models and modelling are described in a functional way that is well applicable in the context of reading cli-fi as (an alternative) form of modelling: Models, Mahr avers, are descriptive of reality but of course only represent a fraction of reality, and are, therefore, marked by what he calls 'identity difference' (*Identitätsdifferenz*, Mahr 2021, 22). It is this difference of identity that allows us to use models for a (limited) range of specific purposes. While these purposes do vary, they all share a functional relationship between the model and the field of application, which is why Mahr suggests that models have always to be seen as 'models of something' as well as 'models for something' (ibid.; emphasis added). Models, in this understanding, are defined by their relationship with reality *as well as* their concrete purpose of

extrapolation. It is this dual function that allows us to see that models, like the cli-fi currently under discussion in the environmental humanities, must be understood, first, as partaking in acts of representation (as 'models of something'). Closer analysis is needed of *what exactly* they are a representation of, however. Second, and equally important for a better grasp of fiction as a future-making technology akin to or complementary with scientific modelling, is that these representations must be understood as 'models for something'; they are, following Mahr's distinction, never only descriptive but always also prescriptive in the sense that they are determined by their potential use or affordances. What can be dubbed the distinction between description and prescription provides the first contours of a new approach to understanding reading cli-fi as future-making practice and cultural modelling.

Gregers Andersen has shown that a similar insight can be traced back to the writing of the philosopher Paul Ricœur, who in an essay from 1991 already describes narratives as models *and* employs a distinction between 'models of' and 'models for' (qtd. Andersen 2020, 19). Ricœur uses this distinction also to challenge too clearly cut boundaries between scientific modelling and concerns formulated in the humanities, especially regarding the study of fiction, and Andersen rightly applies this insight to analyze the elusive phenomenon of imaginaries (and what he calls 'imagination forms'; see ibid., 2) and calls for better integration of transmedial research in this context. We are thus indebted to his work and take it as one of many points of entry into studying cultural modelling, its links with values and norms, as well as its usefulness for probing extreme scenarios.

Applying Mahr and Ricœur's observations to established climate models shows that their very usefulness as well as much of the critique around their ubiquity and authority revolves around the fact that climate models in the sciences are reductive in the sense that they only describe certain aspects of reality, thus reducing complex social data, and that they do so within the functional constraints of their being used in a certain way and to certain ends (Thompson 2022, 198).² Their authority depends to a large degree on the ability of modellers to deal with both the reductive (descriptive) and the functional (prescriptive) value of models, for instance through the creation of multimodel-based assessments (Frigg et al. 2015, 972–973): The better a set of models can redress the limitations of individual models, the better it fulfils the main function of climate modelling. In the societal context in which they have become a key future-making practice, however, climate models are no longer only *descriptive* and *prescriptive* (in Mahr's sense), but they are assessed according to their ability to reduce climate uncertainty and be *predictive*. In the sciences, these predictions are usually understood in the way described here, namely as the result of an interplay between the descriptive and the functionally prescriptive capacities outlined by model theory, which explains the preference for the term 'projection'. Societal acceptance and critique of climate models are a different matter, however. They frequently revolve around the idea that climate models are predictions in the broader sense, and that these predictions—like the predictions of fortune or disaster in folk tales and religious scripture—contain reliable guidelines and prescriptions for behaviour (cf. Hulme 2023).

Scientific model theories and practices that are blind to this aspect of prescription will remain unable to account for social critiques of modelling and of climate action drawing on such modelling. And if the main purpose of complex climate modelling is to provide projections in the sense described above, they cannot but be blind. Because human social and cultural activity '[is] obscured in a black box' (Bonneuil and Fressoz 2013, 35), the 'predictive projections' of climate models and even multimodel-based assessments are unable to factor in individual and collective human behaviour beyond simplistic notions of rational-choice, economic decision-making (see, e.g., Beckage et al. 2020). What is more, because they rely on mathematical means, multimodel-based assessments that try to make up for variety and uncertainty 'can lead to a washed-out response that does not correspond to any model simulation' and that does not explain or project the dynamics of change, especially radical and disastrous social tipping-points (Shepherd et al. 2018, 557; see also Kemp et al. 2022).

These fundamental limitations—of not accounting for a better understanding of the ethical as well as the disaster-sensitive dimensions of future-making and its societal contexts—explain the demand for alternative (cultural) ways of modelling the future. Such alternative tools for creating future projections certainly exist, among them being storytelling and fiction, in other words: literary narratives. We understand narratives here as storytelling that reflects our present realities (times of increasing climate crisis) by building scenarios of (probable or possible) climate futures. As cultural climate models, these narratives add another level of prescriptiveness because they include social behaviours and, thus, norms and values, in individuals as well as collectives. In the following case studies, this will be shown through the example of intergenerational justice. Through the inhabitation of story worlds and by relating them to realities, behavioural norms and values outside of them, readers inevitably engage with future-making beyond representation. We acknowledge that the effect of this engagement remains highly individual and eventually unpredictable but argue that this connection needs to be recognized as a necessary component of any meaningful understanding of futuring practices, including disaster scenarios.

With this focus, our conception also integrates Joe Davidson and Luke Kemp's (2023) call to bring the modes of 'foresight, agitation and imagination into greater dialogue' (6) in climate change communication of worst-case scenarios in and across different discourse domains. Because of our concern with fiction, this means that the texts we have selected for our case studies have been chosen because they partake in the three modes of foresight, agitation and imagination to varying degrees and in specifically insightful ways, which constitutes an important aspect of cultural modelling in general. Although not every fictional text would do so in the exact same ways, and they might serve radically different purposes, cultural modelling, as we understand it, includes elements of *foresight*, which means their descriptive-predictive dimension, with reference to real-life scientific models and data (e.g., as in the case studies, of sea level rise and tipping points for catastrophic floods). It secondly touches on *agitation* by evoking the ethical-normative dimension focused on galvanizing climate action, which can range from warning and pessimism to hope for social transformation. Finally, it engages the *imagination*, that is, the

speculative-reflective dimension, which offers the chance to engage readers' attention through estrangement and empathy, and to highlight the complexities and uncertainties of knowledge about the future.

4 | Storying Scenarios of Climate Futures—Two Case Studies

To substantiate these theoretical claims, we first turn to an analysis of recent British cli-fi, Jessie Greengrass's novel *The High House*. Published in 2021 during the height of the COVID-19 pandemic, a time which brought the interrelations between environmental, health, and other crises and the issue of intergenerational justice into sharp focus, the text imagines futurity and human survival after extreme environmental destruction. The novel is an example of several narratives with similar or comparable plotlines revolving around disaster preparedness and the breakdown of infrastructures and social organization.³ These texts, including *The High House*, deviate from other speculative crisis and postapocalyptic narratives in content and form by foregrounding routines and resilience in the realist description of the scenario they present. Set in a recognizable, near-future Britain, life in *The High House* has approached a climate tipping point, with catastrophic sea-level rise, flooding and storms that have rendered most places uninhabitable. Written in a realist style and touching on matters of foresight, the book suggests a psychologically plausible scenario of survival while also presenting an alternative vision of the nuclear family by focussing on a small group of human survivors. The novel thus negotiates the question of intergenerational justice by revisiting familiar, conservative tropes of hope for the future such as care for children (see Hoydis forthcoming). It also critically interrogates both the normative choice to bring children into such a world in the first place and the question of the limits of altruism, and it thus draws on popular discourses in the realm of agitation.

The High House employs multiple generational perspectives through first-person narrations, as the chapters alternate between the subjective accounts of the characters Caro, who is 18 years old, her stepbrother Pauly, who is 6 or 7 at the beginning of the novel, and Sally, who is in her thirties. Other characters, who both die during the narrative, include Francesca, the mother of Pauly and a climate activist who puts matters of global justice over her own family, risks her own life in the process and is killed abroad in a storm, and Grandy, a grandfather figure in his seventies. A first connection between ethics and scientific foresight is provided through the character of Francesca: for her, 'it was a kind of furious defiance that had led her to have a child, despite all she believed about the future—a kind of pact with the world that, having increased her stake in it, she should try to protect what she had found to love' (HH 19). Accordingly, she has meticulously prepared for the eventuality of her own death and provided a safe place, the eponymous High House, a fortified cottage in a village on the coast that has a history of surviving floods, for Pauly, Caro (as Pauly's primary caretaker), and Sally and Grandy as guardians of the house. With the trope of preparing (or prepping?), the novel also includes the agitational aspect, albeit in a reflexive—that is, fictionalized—way. A notable absence in the narrative is Pauly and Caro's father, another scientist, who shares Francesca's commitment to climate activism

and pays for it with his life—but that is all the reader learns about his character. The second part of the narrative details the characters' efforts to survive and live self-sufficiently at High House, with the narrative focussing on descriptions of routines, before and after a disastrous storm and flooding.

The younger generations, represented by Caro and Pauly, are described as living 'in that space between two futures, fitting our whole lives into the gap between fear and certainty'; in the process of growing up, Caro remembers how 'crisis slid from distant threat to imminent probability and we tunes it out like static, we adjusted to each emergent normality and we did what we had always done—the commutes and holidays, the Friday big shops, day trips to the countryside, afternoons in the park' (HH 19–20). There is a strong sense of stability through repetition: Before disaster strikes, Caro notes that '[e]very day [is] the same. And, in the routine of it, I had found that I had misplaced my fear'. (42; emphasis added). After the disaster, however, she similarly notes: 'We fall into a pattern, and life is set' (HH 149; emphasis added).

While it successfully engages with the human dimension of disaster resilience by meticulously describing such patterns and routines, the narrative also gives insight into intergenerational feelings of guilt: Francesca felt guilty for placing the 'general needs of a population above the real and specific ones of her family' (HH 26), but she tried to pay her dues by sacrificing herself for the greater good while still making provisions for the survival of her child: 'And it's too late, now [...]. All we can do is choose who we will save' (HH 107). This justification of being selective in one's concern and care is presented as both ethically problematic and necessary. It is also reflected in Caro's suffering from 'survivor guilt':

What option is there, in the end, for those few of us [...], but to be the unforgivable, and the unforgiven? All those who might have lived instead of us are gone, or they are starving, while we stay on here at the high house, pulling potatoes from soft earth.

(HH 43)

Similarly, Sally, in her position as caretaker and the one responsible for managing supplies, struggles to justify to herself the decision to not save anyone else outside their group—people they see walking by or meet online when there is still access to the internet:

I saw those thousands and thousands of faces, those multitudes of hopeless people in their rain-soaked clothes, [...] and I decided that Pauly was more important, and Caro, too. [...] I had to draw a line, and so I drew it, and Pauly is still alive, and so is Caro, and so am I.

(HH 228–229)

Justice is negotiated between individual survival instinct and the necessity to 'draw lines', which constitutes an integral part of the text's modelling of (un)just climate futures as they have become a reality in the characters' world. Sally notes how

the future had slipped into the present—and, despite the fact that we had known that it would come, the overwhelming

feeling, now that it was here, was of surprise [...]. I saw what was happening, and my safety sat on me like a weight, but there was Pauly to think of, and Caro, and Grandy. We only had enough for ourselves.

(HH 226)

Through the alternating perspectives provided in different chapters, the novel builds a scenario of individual and collective responses to disaster and despair, including a prevailing sense of loss, but also agency in the characters, as well as experiential and individualized accounts of resilience. As a child, Pauly is the only one without a proper memory of a 'life before' the disaster. For example, his idea of shopping consists of going to the barn where the supplies are kept: 'I can't imagine a world in which I had a choice' (191). This reads, strangely, like a blessing in disguise, for he is spared the crippling sense of loss that finds expression in the older characters' constant compilation of inventories of their losses, primarily of comfort and consumption, for example in Sally's mental lists of 'the things that I miss [...]: being warm in winter; the clean feeling which comes from using soap. Butter. Coffee. Hot running water from the tap. The routine absence of hunger and worry' (194). While in terms of intergenerational justice, Pauly has clearly inherited a world with less of everything, the text is ambivalent in its presentation of (any sense of) hope for the future. Future-making is here reduced to resilience and adaptation, rather than crisis aversion or transformation. In other words, and regarding the above-mentioned discourse domains, its imaginative thrust is less in the direction of willed societal change but rather focusses on uncertainties and the calamitous effect of catastrophes on familial and social dynamics, all detailed in rich, qualitative accounts of personal experience and complex social relations.

The text's open ending follows the death of Grandy due to old age. Readers can imagine the remaining three characters to go on living for several years to come, but in all likelihood, Pauly will die alone. This makes readerly reactions potentially conflicting or divided: the novel's future scenario can be read as an ambivalently hopeful one as it suggests that as such, humanity continues, and that, by taking care of each other despite adversity, humans manage to survive and even reach a sort of temporary happiness. Or it can be read as utterly hopeless because resilience means little in a world of such profound loss. The novel confronts readers with such an ambivalence that pits human survival against individual loss and struggle, and we note that like other current cli-fi texts, it implies that without the child, as the signifier of the next generation, the other characters would not have had a reason to go on struggling. It is interesting, especially regarding intergenerational justice, that the novel tries to imagine how children—or those not borne yet—might grow up in a world when the end of society as we know it has already happened. But rather than experiments with collective narration or a global perspective, we find a focus on single individuals and their stories. There is also a pronounced concern with individual character development, and a reassessment of values and ways of living. Centrally, we are confronted with the trope of raising a child that in this text functions less as a signal of hope for the next generation but as a means to give a sense of purpose through familial care. Following the understanding of cli-fi as a form of cultural

modelling, we can see the ways in which the text—like many others—carefully selects individual aspects of disaster and calamity (most notably of social responses within the context of close, familial or quasi-familial bonds) and combines this modelling of socioecological catastrophe with extrapolations on its implications for issues of ethics and justice. It requires the extreme event to get the plot going and to engage in the human-focussed scenario-building activity. And it negotiates questions of generational (in)justice and its experiential dimension in ways that scientific models would surely be unable to follow.

Though formally very different from the novel, and written to be performed in front of a live audience rather than to be experienced alone, drama is well suited to stage debates, emphasize different conflicting perspectives, and explore collective futures, especially because of its spatial and dialogical arrangements. Our second case study, Rory Mullarkey's *Flood* (2022), also imagines a 'drowned' world but does so by way of an even more extreme scenario. Its focus is not so much on individual characters and their relationships but on the idea, and allegorical rendition, of humanity as a collective. The slippages between the scales of individual and collective humanity are another feature that distinguishes cultural modelling from scientific climate models. Scale problems are notorious in scientific modelling, and as research in the environmental humanities has shown, literature offers productive ways to understand scale effects and sensitize for the importance of scaling (Heise 2008; Clark 2015; Bartosch 2019).

Flood is a play for young performers, designed for outdoor performance, written with an activist agenda, and adjustable for casts of potentially several hundred actors. It premiered at the Hong Kong Youth Arts Festival in September 2018 before being performed in the United Kingdom. In 2023, the play saw an innovative iteration as an immersive experience combining XR with live theatre, in collaboration with Megaverse UKRI and XR Stories. The play engages with issues of foresight when it highlights flooding as a major global issue and probable future scenario. It focuses especially on the impact of exclusionary politics and increasing ruptures between the young and the old, and self and others. Its tone is both realist and allegorical: flooding is presented as one realistic scenario of a 'dystopian near-future' (Reid 2019), but it also stands for the effects of climate change more generally and symbolically. Taking inspiration from Greek tragedy and the biblical flood, it features five main characters (Nat, Roil, Jaf, Mini, Emz) and a chorus, embodying a collective 'we', which comments on the morally charged action. Scene 1 opens at a Lighthouse, during a rain-storm that becomes increasingly menacing. The Chorus recites: 'We saw that Hell is not flames. Hell is water./[...] A flood rising to swallow up our homes/Our former homes already/For by now we knew that all was lost' (F, 90).

The scenario presents a changing world, submerged by water: 'Where once was solid ground/A liquid quilt/A vast lagoon/A gloop of rain and silt/Where bodies floated/Cars and lorries sank' (F, 92). The characters seek refuge at the lighthouse, whose keeper Nat (Noah), tells them about his dream of building an ark that will carry the survivors to new and dry land. In the ensuing debate of how to organize this, each of the characters represents a different ethical attitude and thus self-consciously employs

elements of agitational discourse: Roil blames Nat for appointing himself as the 'new Messiah' (F, 98) of this disaster, while Jaf calls for anarchy and advocates selfishness in the struggle for survival: 'It's every man for himself/[...] The world's our fucking sunken oyster/And we can do whatever we want/It's our choice to/Create or to destroy' (F, 99–100). Mini, in the meanwhile, is hesitant, fearful, and full of uncertainty, pledges solidarity and the need of people to look out for each other. Emz, the realist voice of reason, proposes to focus on practical things and bare necessities: 'What we really need is food/And shelter/Safety/Drinking Water/Then/We need to find a place where we can start again' (F, 102). Meanwhile, the chorus emphasizes the value of this collective struggle: 'Happy only in that we were not alone/As we set off/Into the watery unknown' (F, 103). It eventually leads the small group of survivors on their improvised vessel through 'the whole drowned world', corpses and carnage everywhere, water invading everything and eroding any sense of orientation and safety: 'Our ears were full of liquid and our eyes were blind' (F, 104).

It turns out, however, that the ship is stuck and overcrowded, prohibiting moving forward—an environmental leitmotif and metaphor for the current situation of humanity. Faced with having to find a solution before they run out of supplies, Emz notes: 'We're stuck, in essence' (F, 106). This also invokes the ethically difficult trope of the lifeboat that can only carry a limited number to safety—echoing the need to 'draw lines' in *The High House*. Realizing that the only option to reduce weight is forcing people overboard, Jaf concludes: 'Some of us'll have to go. [...] It's for the good of the rest of us' (F, 109). He then appeals to the others to voluntarily sacrifice themselves: 'It's the end of the world/And we've all had a good run/And I've talk that drowning might be fun/Some say it's the most pleasurable way to die/[...] So who wants to give it a try?' (F, 110).

In the final scene, the characters have found another solution and built stronger sails, and we see them floating on the water in their make-shift vessels. While the sea only provides an instable, liquid ground and a continual source of fear (F, 115), the ethical debate between the characters returns to questions of responsibility and blame for their situation. Mini sees the flood as a punishment for humanity: 'we've lived badly for too long/[...] Somehow the world wanted to say/Enough is enough' (F, 116–117). This is contrasted with the opinion that this generalizing self-blame and demonization of human nature is unjustified: 'But we didn't deserve this/I really think that we should think/That/At heart/We are good' (F, 120). The play ends with Jaf (as a kind of Jesus figure) leaving the boat and walking on the water toward the sun, with all remaining survivors following him. We can either read this as a metaphor of collective hope, which implies that humanity will potentially find a new form of coexistence with the ocean, or as a collective suicide. There is an emphasis on the possibility of salvation—however, ambiguous and temporary—all the while the final comment of the chorus remains pessimistic about the future and the capacity of humans to alter their ways: 'We knew something inside ourselves would always stay the same:[...] despite the price we paid in lessons learned,/Despite the price we paid in blood,/We knew that Earth had not yet seen its final flood' (F, 126).

Intersecting realism with biblical allegories and apocalyptic templates, the text models climate futures of a fictional Britain in the grip of unprecedented, catastrophic floods while also hinting at

the possibility of salvaging hope. Rather than simply engaging in agitation, it reflects on the tropes and arguments of ethical debates in the imaginary scenario of a disastrous flood. Both texts thus connect elements of foresight and agitation through the imaginative mode, which allows them to devise and explore scenarios and to render clashing attitudes and values visible and discernible. Through their focus on extreme cases, they can foreground emotional responses such as fear and dread, as well as uncertainty about the future and the choices and decisions it will require. Notably, both texts also share the conviction that humans are capable of adaptation and resilience, but that the crux of the matter is that there is no agreement on how to act and coexist in the world. Jointly, they leave us pondering the question: ‘So what now?/We’re just stuck?’ (F, 121).

5 | Conclusion: Just Models?

The question whether cli-fi can and ought to be understood as a future-making technique—as cultural modelling—must be seen in its broader context: the overarching question of what literary texts might contribute to climate change communication and public as well as professional debates over climate futures. In a previous book, *Climate Change Literacy* (Hoydis et al. 2023), we argued that the function of literature can and should not be reduced to a form of information transfer (i.e., help to better understand facts about climate change) or to its affective dimension of evoking sympathy (e.g., with heroic climate activist characters or characters suffering from the impact of the climate crisis). Instead, we found, it can play an important role in fostering a more adequate understanding of, and cultural response to, climate change. We advance this idea here by suggesting that this role should be understood as one in individual and collective future-making in various forms of narrative.

This notion necessitates a transmedial ecocritical practice of theorizing literary and other narratives as a form of cultural modelling hitherto overlooked by both the dominant modes of scientific (climate) modelling and some literary and media scholarship on cli-fi. Such an approach is needed for a persuasive case for the role of the literary environmental humanities in the climate crisis (cf. Levine 2023). Moving beyond representation and examining literary fiction as a form of cultural modelling has, in our view, several benefits. It situates literary writing within a larger conversation on future-making practices and underlines the contribution of the environmental humanities in tackling the challenges of uncertain and precarious futures. It has substantial implications for pedagogical practices of fostering and supporting future literacies and the educational endeavour of future-making (Hoydis et al. 2023). And, maybe most importantly, it provides crucial insights needed for the elicitation of robust evidence for the importance of values in future-making technologies.

As we have argued above, climate models are among the most authoritative tools at the disposal of societies engaging with questions of foresight and projection. And yet, they are strangely blind to societal and cultural dynamics because they are ‘not intended to deal with questions of justice’ (Rubiano Rivadeneira and Carton 2022, 1). This is despite the fact that it has by now been established by ‘philosophers of science [that] social values are integral to [scientific] research’ and that ‘an opaque, inscrutable

tapestry of values lies behind [multimodel frameworks in climate modelling], due to the models’ size and complexity, distributed epistemic agency and generative entrenchment of methodological choices’ (Pulkkinen et al. 2022, 4). This insight notwithstanding, scientific modelling to this day remains incapable of integrating dimensions of value, normativity and sociocultural meaning because its dependence on mathematization and parametrization prevents it from including the emergent and nonlinear social processes inextricable from said values, norms and meanings. In a more inclusive and comprehensive interdisciplinary debate on climate modelling, a ‘model’ could be seen as a boundary object and travelling concept that meaningfully connects environmental or earth system sciences and the environmental humanities. Thus, instead of advocating for a better ‘awareness of values’ and the reflection of the ‘relationship between science and society’ by making humanities—especially ethics and philosophy of science—obligatory for science education, we are making the stronger claim that future modelling might indeed require proper humanities and humanities-leaning social sciences. This work offers more than soft-skill training for scientific modellers: it is a crucial part of the interdisciplinary conversation of designing, developing and interpreting more comprehensive model ensembles and multimodel-based assessments (Frigg et al. 2015, 972–973).

However, there is good reason to understand cultural modelling not as part of a larger interdisciplinary conversation only, but as a future-making technique in its own right. This has to do with readerly reception and the question, mentioned above, what it is exactly that is being modelled culturally. As we have indicated, cultural modelling draws on discourses and practices of ethics and justice. It uses them to build a complex case for social dynamics and human interaction, hitherto mostly overlooked by scientific modelling. As we have shown with reference to Davidson and Kemp, the principal discursive modes of foresight, agitation and the imagination—originally conceived of as linked with the specific discursive contexts of scientific, activist and fictional speech—are productively and self-consciously combined in narrative and cultural modelling. Fiction matters not because it is a self-contained third mode of engagement or because it shuns from making predictions (‘foresight’) or providing prescriptions (‘agitation’). Rather, it forcefully combines these modes and comes into its own, especially in extreme-case scenarios, where social interaction is complex and contradictory epistemic and normative orders are clashing.

Cultural modelling differs significantly from the purposes of scientific modelling in another key way. Scientific modelling has as its main point of reference past, present or future realities. Close analysis of the links between literary references to scientific models and intertextual engagement with myth and metaphors—as in the case of the flood and the ark—points to the fact that cultural modelling aims not at empirical realities, but human imaginaries. These are understood as ‘held in common by members of a particular social group’, as operating ‘across the boundaries of the perceptual and the material’, and as ‘collectively shared sets of beliefs, narratives, technologies, discourses, and practices that condition what climate futures are thought of as possible, likely, or (un) desirable’ (Hulme 2022, 230; emphasis original). Climate imaginaries are thus unique in their inclusion of norms and values alongside other factors, such as climatic systems, but also

institutions and societal practices, all of which remain beyond the purview of the sciences and their models. And while they are shared by groups and collectives, they shape individual engagements with cli-fi (and other future fictions) and are in turn shaped by them. Understanding the specific identity difference in cultural modelling requires that research links cli-fi not only with 'reality', but with imaginaries. Only then can it grasp the impact of fiction on individual and collective climate imaginaries. At the same time, it needs to see that fiction is read and employed against the backdrop of existing yet dynamic climate imaginaries.

This explains why literary fiction is experienced differently across different demographics and relative to individual levels of literacy and predisposition to reading fiction. The ending of *The High House* shows this clearly: whether it is perceived as hopeful, as a warning, or as a pessimistic elegy of loss, is a question of the imaginaries of its readers. And whether readerly climate imaginaries, in turn, are hopeful, apprehensive, or downright fatalist has to do with the narratives and media they encounter and which shape their imaginaries as well as the ones of the collective in which they are embedded. If, by better understanding this complexity, the environmental humanities can argue for the import of climate imaginaries in modelling, they will not only provide insights useful for the scientific debate of climate models but also for establishing cultural modelling as an analytical frame through which the connection between description and normativism can be approached. While it is well-known that it is logically impossible to deduce normative or ethical claims from the factual description—a powerful philosophical assumption known as 'Hume's Law'—it is equally vexing for climate scientists and activists alike. Cultural modelling research can theorize, and assemble robust evidence for, the connection of description and prescription in climate imaginaries. This, in turn, might ameliorate shortcomings in climate change communication and education, both of which to this day assume that scientific description, as found in graphs, numbers and climate models, will automatically exert a prescriptive, normative force on behavioural and ethical choices and agency. What is needed, instead, is a better communicative and educational awareness of the construction, consolidation and reconfiguration of varied and open-ended climate imaginaries, in relation to intergenerational justice as well as other aspects of desirable or undesirable futures.

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Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Endnotes

¹While we take inspiration from previous studies, which have employed the notion of cultural modelling, for example for eco-critical readings of nineteenth-century fiction (Taylor 2013) or in educational settings (Lee 2008), this article delineates the conceptual frame of the project "Just Futures? An Interdisciplinary Approach to Cultural Climate Models" (2023–2026). The wider context of the project explores climate imaginaries across different media, including novels, drama, personal essays, teaching materials, and social media discourse and brings together literary studies, linguistics, STS, and literature pedagogy. For perspectives on modelling and experimental 'cli-fi', see Gurr (2024), on linguistic analysis of social media discourse see Schwegler et al. (2024). A second point of reference is found in the important work on comparable practices, associated with cognate or related terms, such as scenarios or pathways (see Tyszczyk 2021; Tyszczyk and Smith 2018).

²We don't understand text as models in the sense of them necessarily providing new 'design blueprints—for real social formations' (Levine 2023, 21), although they might serve this function; we also avoid making claims about certain texts providing better or more accurate models of climate futures which Heather Houser rightly calls 'the potential dead-end of casting success-fail verdicts on particular cultural works' (2020, 6). However, we conceive a textual model, like its scientific counterpart, as an inevitably uncertain, value-laden but still useful 'tool and as a guide for thinking and communication' (Thompson 2022, 8).

³To limit examples to the British context here, these include recent novels such as Oana Aristide's *Under the Blue* (2021), Bethany Clift's *Last One At the Party* (2021) and Claire Fuller's *The Memory of Animals* (2023); as well as older texts like Martine McDonagh's *I Have Waited, And You Have Come* (2006).

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