

Modeling the Pitfalls of Climate Change Communication: Kim Stanley Robinson's *The Ministry for the Future* [unpublished draft – please do not circulate further]

Abstract: Drawing on recent work in the field of model theory, this essay engages with the challenges of fiction-based climate change communication and presents a reading of Kim Stanley Robinson's 2020 novel *The Ministry for the Future*. It interrogates two key fallacies about fiction and climate change communication: that literature should provide factual information and that emotional identification is needed in order for literature to be an effective aid in the process of communicating climate change. Suggesting an alternative understanding, critical findings from the literary analysis are integrated into an ecocritical approach to cultural modeling.

In the approximately two decades in which climate fiction has become a prolific genre of its own, it has evolved significantly and developed a number of characteristics that make it a relevant, if unwieldy, factor in successful climate change communication (Goodbody). Despite its growing visibility and the increasing awareness of its potential, a number of concerns have emerged in ecocritical analyses of fiction-based climate change communication that warrant closer attention¹: one such concern is that climate fiction is often a form of 'preaching to the choir' – those who read climate fiction are frequently not the ones in need of further elucidation on the threats of climate change (Schneider-Mayerson, "Influence of Climate Fiction" 478–79). Another key issue relates to affective and cognitive strategies of much cli-fi of the anglophone Global North: the use of fear and the engagement with a growing sense of urgency (Wagner), the use of fiction for "info-dumping" or "hectoring" (Goodbody and Johns-Putra 9; Hoydis, "Dialogues" 16), or the simplistic reliance on identification with sympathetic characters. One task of an ecocritical approach to climate change communication in and through fiction therefore lies in understanding how literary texts "model processes of environmental learning" beyond the didactic impulse of seeing texts as vehicles for information or triggers of emotional response (Goodbody 320).

Judging from its many reviews, as academic engagement with the text is still scarce,² Kim Stanley Robinson's 2020 novel *The Ministry for the Future* appears destined to become an instant 'classic' in the cli-fi genre. This, we argue in this essay, is partly due to the fact that it "model[s] processes of environmental learning" (Goodbody 320) and in virtually unprecedented fashion supports reflections on the pitfalls of climate change communication.

In order to show how Robinson's novel functions as a 'theory-generating novel' in this regard, drawing on model theory (esp. Mahr, "Modelle und ihre Befragbarkeit), we first introduce the potential of a cultural theory of modeling and outline an understanding of texts as 'models of' and 'models for' debates on climate change. This will help us to address what we take as the key challenge connecting both climate change communication generally and the above concerns about the role and potential of fiction specifically: the intricate entanglements between descriptive and normative accounts of climate change (Latour 43). We argue that the classic 'is-ought problem' – which philosophy knows as Hume's Law – is at the heart of much of the climate debate and therefore also constitutes a key concern when thinking about fiction as a means of climate change communication. Secondly, we draw on research findings concerning the development of cli-fi (e.g., Goodbody and Johns-Putra; Johns-Putra) to situate the genre within the field of climate change communication and to show in which ways *The Ministry for the Future* compellingly addresses some of its key challenges. What interests us here is thus emphatically *not* whether the strategies of transformation depicted in the novel are realistic or whether its normative impetus could and should be followed. Rather, we investigate how the text can be read as a potential instrument in climate change communication that in a highly reflexive way unfolds the theory that informs its own practice of communicating "climate imaginaries" (Hulme 225).

1. From 'Is' to 'Ought': Texts as 'Models of and for' the Climate Debate

The debate about climate change and, by extension, about climate change communication, is complicated by the fact that its concepts are 'thick.' In philosophy and anthropology, a concept is called 'thick' if it contains both descriptive and evaluative components (Müller-Salo 17). While it is logically impossible to come from the descriptive to the normative side of things – an 'ought' can never follow from an 'is' (Hume's Law) – the transition is common in everyday thinking and speaking, especially if moral concerns seem somewhat obvious. In Bruno Latour's persuasive example, "[i]f you are on a bus and you see a passenger is about to sit down on a seat where you have put your baby, the statement that you won't fail to make – 'There's a baby on the seat' – will certainly be a constative utterance ... and a performative utterance" at the same time (47–48). Latour's point is of course that information about climate change and an allegedly neutral voice from science no longer suffice as descriptive statements when the biosphere is in peril, rendering climate change an exemplary case of the is-ought problem: the utterance 'The planet is on fire' can hardly be met without strong evaluative responses. "Astonishingly," Latour concludes, "this type of utterance now comes not only from poets,

lovers, politicians, and prophets but also from geochemists, naturalists, modelers, and geologists" (49).

We argue that fiction not only engages with these issues on a thematic or representational level, for instance by including science communicators as well as skeptics into its personnel and thus showing how the 'is' of scientific fact is notoriously turned into different and incommensurable 'oughts.' Fictional discourse itself can in addition be said to spell out the problematic yet pervasive move from description to evaluation, thus rendering literary analysis a productive tool for reflections on the is-ought problem in climate change communication. In order to make this case, we suggest conceptualizing fiction as an instance of cultural modeling.

According to a general theory of models (Stachowiak 131–33), all models share the characteristics of being (1) representational, (2) reductive, and (3) pragmatic. A model may therefore be defined as a simplified physical, digital, or mental representation of a more complex outside entity to which it must be functionally or structurally similar. Models are devised or chosen for a specific purpose and – depending on that purpose – will selectively focus on different characteristics, elements, or connections of the system perceived as central to this purpose while disregarding others. Thus, a map of a city with color-coding in green, yellow, or red to represent high, medium, or low average incomes per district is a model of that city in that it (1) represents the city, (2) does so in a highly selective, simplified, abstracted, and aggregate form, and (3) does so for specific purposes – possibly to support decisions about where to launch social cohesion programs – while it would be largely useless for other objectives.

Mathematician and information theorist Bernd Mahr has argued that models should additionally be understood in their dual nature of always being both "models of" and "models for" something:

A model is always based on something *of* which it is a model, i.e. departing from which or referring to which it has been produced or chosen, its matrix. The purpose of building or choosing a model is its use.... One of the typical uses of models is their use as *a means of designing [or creating]* something. [Here] models are samples, preformations or specifications.... The notion of the model can therefore only be explained convincingly if it is acknowledged that a model is always both a *model of something* and a *model for something*. ("Modelle und ihre Befragbarkeit" 331–32; emphasis original; our trans.)³

Adapting this notion, a model can be understood as being to varying degrees both the descriptive rendering of an entity *of* which it is a model and, at least implicitly, the prescriptive blueprint for the design or transformation of a future entity *for* which it is a model. With regard

to fiction-based climate change communication, it seems relevant further to broaden this notion to encompass prescriptive accounts of 'ought nots' – including, for instance, dystopian writing, cautionary tales, and worst-case scenarios of all sorts. A literary text can thus be understood as modeling the climate crisis if it is, again to varying degrees, descriptive in its representation of (parts or facets of) the crisis, its causes, or consequences and if it is, sometimes only implicitly, prescriptive in that it formulates directions or options for an engagement with or response to the crisis or suggests novel ways of reading the crisis because of its engagement with the normative polyphony that any 'thickening' of facts entails. This dual nature is also evident in the fact that texts not only represent an external reality but centrally contribute to shaping perceptions of reality and thus to highlighting that a different world is at least conceptually possible or that a different understanding of it might be valuable.

The notion of texts as models lends itself to being applied to a wide range of representations of and engagements with the climate crisis, and we are building here on extant work in the field that conceives of textual practice as a practice of modeling (Bartosch, *Literature*; Taylor). What we are adding to the theoretical discussion and will also point out as central to a reading of Robinson's novel, is the notion that novels can reflect on the is–ought divide at the same time that they are bridging it themselves. However, and more clearly than in Mahr's original conceptualization, where "model of" and "model for" are two sides of the same coin or may only be gradually more or less prominent in different models, 'model of' and 'model for' are here regarded as occurring in different combinations and gradations. To be sure, Mahr clearly states that models "can be used for very different purposes: models can be descriptive for us, like Bohr's model of the atom, prescriptive, like [an ISO standard], conceptual, like the architecture of a software system [and several further purposes]" ("Modelle und ihre Befragbarkeit" 332; our trans.). For our purpose, however, it is precisely the combination of and oscillation between 'model of' and 'model for,' between descriptive and normative components, that needs to be conceptualized more clearly.

There has recently been an increased interest in adapting a general theory of models (with frequent references to Stachowiak and especially to Mahr) to literary studies and in disciplinary literary and cultural studies approaches to the theory of models (see several contributions in Balke et al. as well as in Dirks and Knobloch; Wendler). Pioneering work has been done, for instance, in two research training groups in Germany (e.g., Erdbeer; Matuschek and Kerschbaumer; for a different account, see Frigg). Moreover, model theory is productively being used in interdisciplinary contexts, for instance in exploring the relations between aesthetic and economic modeling (see *Model Aesthetics*), or in the field of literary urban studies

with an understanding of texts as qualitative models complementing the quantitative models currently dominant in urban research (Gurr). We argue that, given the prominence of is–ought confluences in climate change communication, model theory might be especially productive in this field, too.

2. Two Fallacies of Climate Change Communication through Cli-Fi

As a “significant body of narrative work broadly defined by its thematic focus on climate change and the political, social, psychological and ethical issues associated with it” (Goodbody and Johns-Putra 2), cli-fi has many forms and faces. It has roots in science fiction, but has over the years come to embrace and incorporate speculative and realist fiction, thriller plots, elegy, personal memoir and other genres and modes. We now seem to have entered a new phase, in which a growing sense of urgency and ever more apocalyptic prognoses about the acceleration and the increasing impacts of climate change appear to have influenced cli-fi production. The beginning of this new phase might be situated around 2018: in climate science, this period saw the publication of the 2019 IPCC *Special Report on the Ocean and Cryosphere in a Changing Climate* with its grim prognosis of a “decrease in global biomass of marine animal communities, their production, and fisheries catch potential, and a shift in species composition ... over the 21st century in ocean ecosystems ... under all emission scenarios” (IPCC 22) as well as the first part of the 6th IPCC Assessment Report (2021) with yet clearer and more dire diagnoses of the state of the climate system. In climate activism, this has been the time of widely publicized milestones such as the emergence of the “Fridays for Future” movement in 2018/2019 or Greta Thunberg’s “I want you to panic” speech in Davos in 2019. Moreover, the unprecedented number and intensity of storms, wildfires, droughts, heat waves, and floods in the years since 2018 – all, as attribution science tells us, further instances of the reality of climate change (Otto) – appear to have brought home to all but the most die-hard climate skeptics that climate change is not an abstract problem of the future. One widely publicized and hotly debated response to this increasingly gloomy outlook has been Jonathan Franzen’s 2019 *The New Yorker* essay “What If We Stopped Pretending?” with its claim – often read as defeatist – that “[t]he climate apocalypse is coming. To prepare for it, we need to admit that we can’t prevent it.”

In keeping with drastically increased public awareness of climate change in this phase, there appears to be a growing consensus that those who read climate fiction know the facts and need no wake-up calls – much recent cli-fi has thus tended either to focus on inspiring hope and on pointing out solutions *or* on the recognition of inevitability (*sensu* Franzen) and on

elegiac representations of loss and mourning. A case in point for the latter is Charlotte McConaghy's 2020 novel *Migrations*. Set in "a future near enough you could almost mistake it for the present" (Morton), the text laments "[a] nameless sadness, the fading away of the birds. The fading away of the animals. How lonely it will be here, when it's just us" (McConaghy 62). Passages such as the following are representative of this type of fictional response to the climate crisis:

There are no more monkeys in the wild, no chimps or apes or gorillas, nor indeed any animal that once lived in rain forests. The big cats of the savannas haven't been seen in years There are no bears in the once-frozen north, or reptiles in the too-hot south, and the last known wolf in the world died in captivity last winter. (McConaghy 24)

In light of these developments, it seems pertinent to pay attention to two misleading assumptions that continue to inform the debate about the efficacy of cli-fi in climate change communication: the first one concerns the role of scientific facts in shaping and changing behavior, while the second one touches on the role of emotional engagement. Skepticism about these assumptions, it seems to us, has also found its way into recent climate change novels, which, in the more ambitious and theoretically informed cases, no longer rely on them or even explicitly provide critical commentary. We propose the designation of 'cognitive fallacy' for the belief that information retrieval leads to meaningful or appropriate action. In climate change communication, the so-called 'gateway belief model' was established to describe this assumption about the role of facts, scientific consensus, and knowledge (Boykoff 54, 151; van der Linden et al.). The notion that a central function of fiction in climate change communication is the transmission of factual knowledge is informed by this line of thinking. However, since literature must not be confused with "the eco-pedagogical department of the IPCC" (Garrard 47), the notion of learning 'through' literature needs to be reconceptualized to overcome a simplistic – if surprisingly prevalent – reliance on communicating facts to "galvaniz[e] readers into action" (Goodbody and Johns-Putra 9). This is one instance where cultural modeling might help.

This also applies to the even more persistent problem of what we propose to term the 'sentimental fallacy': this conceives the emotional appeal of stories as central to triggering appropriate affective and attitudinal responses, either by invoking sympathy or by inviting identification with likable characters. Recent work in cognitive literary studies and empirical ecocriticism⁴ has challenged such a simplistic understanding and demands a more nuanced framework for the role and potential of literature:

Rather than treat emotion as a lever or switch to be directly calibrated and pulled for a desired effect, the climate change communication community should adopt a more nuanced, evidence-based understanding of the multiple and sometimes counterintuitive

ways that emotion, communication and issue engagement are intertwined. (Chapman et al., 852)

Despite these insights, discussing the role of fiction in fostering climate consciousness, Gesa Mackenthun has recently defended the 'role model and identification argument,' stating that

[l]iterature can encourage sustainable behavior by representing exemplary, e.g., carbon-avoiding, actions of believable characters.... inspir[ing] readers to reflect on and imitate the fictional action. This requires narrative access to readers' imaginations which is usually best achieved through the deployment of exemplary characters (inviting identification). (8)⁵

While identification and emotional contagion do play a role in readerly experience (Weik von Mossner), assuming that 'exemplary' actions and characters instigate sustainable behavior seems to us somewhat facile. That literary writing itself occasionally critiques such didactic and idealist notions is a case in point. Take Amitav Ghosh's *Gun Island* (2019): although the novel does in parts – inescapably? – rely on such mechanisms, it is the personification of grand issues, its representation through 'human-interest stories,' that the character of Piya ironically comments on: "'Human interest, huh?' said Piya. 'I guess the sci-comm guys in my university would be happy about that.'" (302). All in all, it seems that neither factual information nor likable protagonists inviting identification quite do the cultural work they are still often believed to do.

It seems to us more promising to think of such cultural work as a form of modeling. Regarding the above findings from model theory, both dystopian disaster imaginaries and elegiac fictions of loss and mourning may then seem to be questionable as 'models *for*' in the narrower prescriptive sense of model theory: they do not function as prescriptive 'models *for*' in that they fail to provide pathways to 'positive climate futures.' However, considering the history of literary cautionary tales and the critical potential of dystopia, with its concentration on the modeling of negative scenarios in order to alert readers to dangerous path dependencies and catastrophic tipping points, it seems important to us also to understand 'modeling *for*' in the sense of such accounts that do not center on optimism. These texts rather present and bring into narrative conversation a polyphony of normative and value-based accounts of scientific facts about climate, thus enabling deeper understanding of the complexity of climate imaginaries as "sets of beliefs, narratives, technologies, discourses and practices that condition what climate futures are thought of as possible, likely, or (un)desirable" (Hulme 230). Thus, if model theory is to allow for a nuanced understanding of the entanglements of descriptive and normative, of 'is' and 'ought,' then to disregard the function of literature in highlighting the 'ought not' would be to ignore important manifestations of cli-fi.

However, given the critiques of doomsterism and the widely perceived need for more hopeful visions of the future, a prime function of cli-fi may well be to provide such scenarios. This need is exemplified, for instance, by the Arizona State University's Center for Science and the Imagination: with its "Climate Imagination Fellowship" program, in which Kim Stanley Robinson is centrally involved, the Center pursues the mission of "[i]gniting collective imagination for a better future" (CSI). Its ambition is thus clearly in tailoring 'models *for*' in the sense *primarily* introduced here, i.e. optimistic scenarios of a world in which humanity 'will have succeeded' in averting catastrophic climate change. This function of the grammatical form of the future perfect lies at the heart of what – beyond the much-needed but insufficient function of inspiring hope – climate fiction of the kind exemplified in Robinson's *The Ministry for the Future* is capable of doing.⁶ Without referring to the future perfect and its grammatical and cognitive functions,⁷ the inspirational effects of such narratives of how humanity 'will have managed' are central to what, in her essay that also briefly discusses *The Ministry for the Future*, Mackenthun terms "Social-Ecological Transition Stories" (7).

3. Novels as 'Models of and for' the Climate Change Communication Debate: *The Ministry for the Future*

Given these insights into the potentials and shortcomings of fiction in fostering climate consciousness, Kim Stanley Robinson's recent *The Ministry for the Future* (2020) may well be exemplary in its self-reflexive engagement with the debate, which goes beyond even what Robinson's earlier cli-fi novels, such as *Forty Signs of Rain* (2004), do in this regard (see also Johns-Putra, "Ecocriticism"): On the one hand, it contains information on a range of fields related to climate change – climate modeling, glaciology, geo-engineering, the global financial system and monetary incentive structures, epidemiology, climate and health, wildlife preservation, and a host of further fields – but it presents them in a highly ambitious experimental literary form that undercuts the charge of mere 'info-dumping,' as we will discuss below. On the other hand, it is clearly a novel of ideas with an agenda of inspiring hope that the climate crisis may still be manageable – an agenda that is not as simplistic as some discussions of the novel have suggested. Seemingly ignoring some of the basic conventions of fiction, critics have read political actions of characters and groups in the novel (e.g., eco-sabotage and the assassination of oil executives) as expressions of the author's views on appropriate means of addressing the climate crisis (see, e.g., the reviews by Probst or by Frame and Flamm). This, however, is not what a model-theoretical take on literary narrative suggests.

Beginning with a harrowing depiction of a heat wave in India that kills millions, Robinson's novel recounts the story of how, over decades and against a lot of resistance and setbacks, humanity succeeds in a transformation toward a sustainable, more equitable world, involving large-scale geo-engineering, sustainable mobility, cooperative agriculture, and major parts of the globe reserved for wildlife preservation. A central agent in this transition is the titular Ministry for the Future, set up as an intergovernmental body in Zurich in 2025 with its head Mary Murphy, one of the novel's two 'protagonists' (a term that will have to be qualified).

One of the central instruments in the transition is a financial mechanism implemented by the world's central banks: carbon quantitative easing, the financial remuneration of carbon avoidance and sequestration by means of carbon coins, a cryptocurrency issued and backed by the world's leading central banks (Robinson, *Ministry* 172–76 *et passim*). The novel here appears to share the diagnosis recently formulated by Amitav Ghosh in his similarly sweeping *The Nutmeg's Curse: Parables for a Planet in Crisis* (2021):

[E]xtractivist capitalism is on its last legs, its end foreordained by the withering of the very horizon on which its existence is predicated – the future. When the future becomes radically uncertain, nothing [financial] works: insurance, share prices, credit, dividends, even money (which is, after all, a promissory note that someone must redeem.) (241–42).

In Robinson's novel, however, the central banks as the guarantors of capitalism's continued functioning, use capitalism to both save it and to transform it from within: initially skeptical, the bankers argue that financial measures designed to make the world economy shift toward sustainability are outside their "purview" of financial stability (*Ministry* 188), until Murphy succeeds in making it clear to them that a world in crisis is inherently unstable: "[The Fed chair, Jane] Yablonski nodded, grimly amused. 'If the world ends, the dollar is in trouble.'" (188; see also 288–89):

If [the world's major central banks] were now using their power to protect the biosphere and increase equity, the world could very well ... take a new course.... And yet by their own criteria, so pinched and narrow, they were doing the necessary things. They were securing money's value, they still told themselves; which in this moment of history required that the world get saved. (510–11)

Through these instances, the novel presents several models of climate action. However, it is clear that no single measure can bring about the change. Although the emphasis on institutions such as the Ministry for the Future or the central banks suggests a top-down approach, this is counterbalanced on the level of the two 'protagonists' by the character of Frank, a development aid worker who survived the Indian heat wave with severe post-traumatic stress disorder (PTSD) and who, throughout the novel, acts as the visible representative of radical, occasionally illegal, and even violent, bottom-up activism. Moreover, numerous references to bottom-up activities also highlight their role in the transition. For instance, a four-page chapter

lists NGOs, activist groups, collectives, and other agents of change toward sustainability and equity (Robinson, *Ministry* 425–28). Bringing together a heterogeneity of different approaches as well as different values, including the strengthening of democratic institutions and economic experimentation alongside eco-terrorism and various personal narratives of loss and resilience, the novel models both potential pathways for transformation and a polyphony of conflicting voices and incommensurable values, both of which we describe as ‘modeling *for*’ or the normative side of climate change communication.

On the side of ‘modeling *of*,’ one of the most striking features of the novel is the unprecedented amount of factual information it provides, with many chapters in the form of meeting notes, lectures, expository essays, first-person accounts, and eyewitness reports. Though this wealth of factual information – on banking, monetary theory, taxation systems, inequality indices, health science, climate science, geo-engineering, glaciology, sustainable agriculture, approaches to wildlife preservation, and countless further, economic, sociological, technological, and scientific concepts – might be dismissed as a grotesquely inflated amount of ‘info-dumping,’ this impression is dispelled precisely through the multiplication of voices and the avoidance of an authoritative climate-expert perspective commonly chosen for such factual expositions in many previous cli-fi novels. Thus, the novel features passages told from the point of view not only of innumerable, often nameless witnesses and victims of climate change as well as scientists, activists, and other agents of change, but also chapters with “blockchain ... code” (Robinson, *Ministry* 177), “the market” (191), “a photon” (235–36), “a carbon atom” (327–29), or “history” itself (385) as speakers. In her insightful review of the novel, Ahne appears still to understate the case when she speaks of “a Dos-Passos-like multiperspectivity” (12; our trans.; for the multiplicity of perspectives highlighted in numerous reviews, see also Berry; Burgmann; Canavan; Poole; Probst).

In contrast, Mackenthun comments on the novel’s “polyvocal concert – sometimes chorus – of impersonal voices” (11) but does not read it as central to its mechanics of climate change communication. Given her assumption that the effectiveness of cli-fi in climate change communication depends on sympathetic characters endowed with enough interiority to allow for identification, she – like others – rather regards the “lack” of “psychological interiority” (Mackenthun 11) as a defect in Robinson’s novel. To us, however, this seems to be precisely its deliberate and informed response to the simplistic assumptions of the ‘sentimental fallacy’ outlined above. Thus, with the refusal to put the many expository passages into the mouth of one or the other ‘interesting’ or ‘likable’ character – often, indeed, of *any* recognizable, individualized character – as well as with the impersonal clipped news-report style, meeting

notes, Socratic dialogue, handbook articles, riddles, or prose poems, and other forms employed throughout, the novel appears deliberately to *undermine* and *prevent* readerly identification. The novel thus 'models' the climate debate in the sense that it represents its complexities and entanglements *and* points out possible directions *for* the debate – however, without simplistic advocacy.

So far, however, discussions of the novel have tended to read it as a thesis novel, a novel that uses fiction for a clear agenda, and have systematically underestimated its potential as a think piece and exploratory text. As an example, we discuss one of the novel's most controversial issues, the role of violence in the transition to a sustainable world: it remains open what share the Ministry's secret branch has in the more radical measures – the shooting down of 60 commercial jets in one day (Robinson, *Ministry* 228), the sinking of diesel-powered container vessels (417), or the assassinations of oil magnates and other "climate criminals" (86, 254, 347, 390–91) – all of which lead to radical, ultimately more sustainable changes in mobility, transportation, and economic production. Take the attack against commercial aircraft:

Everyone alive knew that not enough was being done ... and the pressure kept building. So it was not really a surprise when a day came that sixty passenger jets crashed in a matter of hours.... clouds of small drones had been directed into the flight paths of the planes involved, fouling their engines.... One message was fairly obvious: stop flying. And indeed many people stopped. (Robinson, *Ministry* 228)

A number of critics less attuned to reading fiction as fiction – occasionally, but not exclusively those reviewing it for scientific journals – have read the novel as a rather unsubtle call for action: "violence towards petro-capitalist structures by agents from the Global South is portrayed as justified, even necessary, as a form of anti-imperial struggle for survival" (Frame and Flamm). However, we contest the view that the passage justifies violence. Here, the distinction between the text as a 'model of' and as a 'model for' is crucial again – it is the unwarranted conflation of the two that frequently complicates the debate. Eco-terrorism, we argue, is here represented – descriptively, as a 'model of' possible future developments – as *one potential response* to the climate crisis. However, the passage is far from simplistically functioning as a 'model for' appropriate or legitimate action. Even if one made the crassly utilitarian argument that the "seven thousand ... innocent" casualties of these attacks pale in comparison to the millions who die as a result of climate change and that the attacks, by effectively ending fossil-fueled flying, save many more lives than they cost, this cannot be read as a 'justification'. The crashed flights predominantly involved "private or business jets, and the commercial flights ... had been mostly occupied by business travelers. But people, innocent people, flying for all kinds of reasons: all dead. About seven thousand people died that day"

(Robinson, *Ministry* 228). Thus, if read as a 'model for', the passage delineates the moral dilemmas and the ambivalence of such actions and thus rather invites reflections on the distinction between representations of what *might* occur and what *should* occur. In sum, to conflate the action of individual characters and groups in the novel with the author's personal views⁸ and to read the fact that violence plays a role in the transition as justifying that violence, as some critics have done (Frame and Flamm, but also Probst), ignores the multiperspectivity and underestimates the complexity of the novel. More appropriately, in one of the most perceptive short reviews on the occasion of its German translation being published, Ahne highlights this exploratory nature of the text:

A novel beginning in a very recognizable present and ending in a desirable future: Is this possibly not so much literature as activism? And ultimately one that propagates violence? It is not that simple. Science fiction writer Robinson ... is too good a storyteller to make his novel the vehicle of a message. *Ministry for the Future* is not a how-to manual but a detached exploration of the dynamics that might turn a world driven by the forces of inertia into one of change. (12; our trans.)

“[N]ot a how-to manual but a detached exploration of the dynamics that might turn a world driven by the forces of inertia into one of change” is an apt way of accounting for the dual function of literature that we are here describing by way of modeling theory. Interestingly, as a text that speaks directly to some of the pitfalls of climate change communication, the novel frequently contains explicit reflections *on* these pitfalls: thus, it comments on the cognitive biases that allow people to ignore the threats of climate change (Robinson, *Ministry* 349), on the “tragedy of the time horizon” and the problem that “we can't imagine the suffering of the people of the future, so nothing much gets done on their behalf” (172). It also – following Rittel and Webber's 1973 account of “tame” vs. “wicked problems” (160) – defines the climate crisis and questions of global equity as “wicked problems, in the technical sense of the term [as] problems that not only could not be solved, but dragged other situations down into them; they were contagious, in effect” (Robinson, *Ministry* 482).

In another highly self-reflexive passage, the text even explicitly unfolds a model theory exemplifying the dual notion of models as 'models of' and 'models for' as well as virtually all implications of the distinction highlighted above. What is more, this reflection is to be found in a central chapter depicting the meeting in which the key national bankers first discuss the idea of the carbon coin crucial to both the plot and the conceptual work of the novel. In this chapter, one of the novel's 'protagonists,' Mary Murphy, head of the Ministry for the Future, visits California for a meeting with the bankers and for a number of site visits in this model state. The passage needs to be quoted at some length to show just how many facets of model theory are elaborated on here, including issues of scale (for the notion of scale in ecocriticism,

see T. Clark; and Bartosch, "Scale") and the simplifications and abstractions needed in the reduction of reality to the model, but also the inverse process, the reintroduction of complexity in the return to reality:

California ... ran at carbon neutrality, having established strong policies early on. They were intent to continue that process ... what they were doing was a model other people could learn from.... Inside [a big warehouse] the US Army Corps of Engineers had created a giant model of the California bay area and delta, a 3D map with active water flows sloshing around on it.... The Californians told her and showed her how the northern half of the state was now functioning.... All this they told Mary while looking down on the pretty model of the landscape filling the warehouse, as if from a small satellite.... "It looks great," Mary said. "I hope we can do this everywhere." "Models always look good," Esther said cheerfully. But she was proud of it – not just the model, but the state.

Back in San Francisco ... on the top floor of the Big Tower [the view] reminded Mary of the day before, looking down on the model of California, but this time it was real, and vast. (Robinson, *Ministry* 183–87)

The passage at the end even suggests the need at some point to restore complexity and scale in the return from the model to reality. It therefore seems important that, when it comes to modeling "processes of environmental learning" (Goodbody 320), a discussion of modeling must also bear in mind the danger of mistaking the model for reality, of ignoring the reduction of complexity necessary to any modeling and thus ultimately the need at some point to restore this complexity in an application of the model to reality (Gurr 15–18). Regarding the potential of literary texts in climate change communication, this is the crucial step in which readers need, as it were, to look up from the model and to apply insights gained from the model to our reality. This need for readers to apply insights from the reading of texts to their reality can be conceptualized in terms of what, following Hannes Bergthaller, one might call the 'diegetic leap' from the textual model back to reader's "lifeworld":

At the end of the story, the seed is suspended in mid-air. In order to catch it, to achieve the closure which the text withholds, the reader must reach beyond the text and take the leap from the fictional world of the text into her own lifeworld – i.e., she must interpret the story of her own world Such a conversion is, I submit, the object of all texts that strive to "raise consciousness" or aim at any sort of political effect – and it bears repeating that this conversion is not something that can be traced back to "facts," but an effect of the narrative's structure. (167)

If a text is a plausible model *of* something, its being a persuasive model *for* something can explain how we come from textual to empirical world in a variety of text types and by means of different, yet structurally related ways. Important work on the nature and emergence of literacy (Gee; Mitchell and Burkholder) can build on the insights of an ecocritical approach to model theory which in turn can provide a better understanding of the role and potential of fiction in climate change communication (Bartosch, "Reading").

4. Conclusion

In a way that suggests a complex understanding of model theory and the function of models – an understanding we have shown to be self-reflexively unfolded in the text⁹ – *The Ministry for the Future* models the pitfalls of climate change communication by explicitly discussing *and*, in its own practice, addressing its key challenges: while it occasionally zooms in on individuals and on certain aspects of the problem, it largely refuses to heed what common wisdom argues climate change communication needs to do, namely to scale, to reduce, and to personify. Nor does it simply narrativize information or use emotional manipulation for narrative impact. Robinson's novel, it seems, mobilizes a whole range of occasionally conflicting narrative strategies in its attempt to tell 'the whole story' of climate change and social transformation and to do justice to climate change precisely by looking at it as a complex, "wicked problem" (Robinson, *Ministry* 482, following Rittel and Webber) with its range of scientific and technological, political, economic, and societal entanglements and implications. To understand the novel as an exercise in 'modeling of' and 'modeling for' the climate crisis and the debates about how to address it, helps to make sense of this complex assembly. The same can be said about its personnel: the novel's refusal to provide sufficient psychological interiority ever to allow readers fully to identify with any of its characters undercuts simplistic assumptions about the role of sympathy and identification in climate change communication through fiction.¹⁰

We therefore suggest that reading texts as responses to the previously identified fallacies – the 'cognitive' and the 'sentimental fallacy' – and *as literary texts* does better justice to narrative perspectives, questions of identification, and the manipulation of sympathy, as well as to challenges in climate change communication. Kim Stanley Robinson's *The Ministry for the Future*, like few other texts to date, lends itself to such a reading, just as it lends itself to highlighting the productivity of model theory in addressing the oscillation between normative and descriptive, between 'is' and 'ought' and between 'model of' and 'model for' in climate change communication.

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¹ As Hoydis notes, “the difficulties of communicating climate change in any medium [concern] the challenging complexity of science, scales, causalities and temporalities involved and its nature as a truly global, yet only slowly unfolding crisis” (“(In)Attention and Global Drama” 340); for a more detailed summary of approaches to cli-fi novels, film, and drama, see the section “Theme IX: Climate Change Fiction” as well as other interdisciplinary perspectives in Holmes and Richardson.

² Apart from numerous reviews, there is as yet little to no scholarly engagement with the novel. A brief discussion is to be found in Mackenthun.

³ See also Mahr, “Ein Modell des Modellseins”; for this dual nature of models, see also Geertz 93 and Yanow.

⁴ See Schneider-Mayerson, “‘Just as in the Book’”, “The Influence”; Schneider-Mayerson et al.

⁵ For a summary of the ‘sympathy and identification’ argument, see also Goodbody and Johns-Putra 7–8.

⁶ For a perceptive discussion of Robinson’s influential earlier *Science in the Capital* trilogy and its “Utopian Vision,” see Johns-Putra, “Ecocriticism”.

⁷ In this understanding of the normative sense of the future perfect, we take our cue from the German foundation FUTURZWEI (literally: ‘future perfect’), which seeks to work toward a more sustainable, resilient and livable future through the telling of success stories of how, again from a future vantage point, this ‘will have been achieved’ (see futurzwei.org, as well as Giesecke et al.; for this function of the future perfect, see also Mattheis and Gurr).

⁸ In an interview with Brady, it is clear that Robinson finds violence against individual oil executives problematic and does not advocate it but believes it may happen. He also makes it very clear he does not condone many of the opinions voiced by characters in the novel.

⁹ The novel can thus be read as a ‘theory generation novel,’ not in the sense in which Dames or R. Clark use it – as a novel by a member of the generation informed by ‘Theory’ (they name Teju Cole, Jennifer Egan, Ben Lerner, and Jonathan Lethem) – but as a novel that in highly reflexive ways unfolds the theory that informs its own practice. We might thus rather speak of this type of novel as a ‘theory-generating novel.’

¹⁰ McEwan’s *Solar* (2010) comes to mind as a novel that in similarly self-reflexive ways goes beyond simplistic assumptions about the role of identification and sympathy (Hoydis, *Risk* 537–54).