

# On the Difference between Anthropocene and Climate Change Temporalities

Julia Nordblad

## Competing Conceptions of the Environmental Predicament

An increasing number of scholars in various disciplines grapple with the issue of how the complex threats to the planet's life-support systems should best be understood and addressed. This essay compares two dominating conceptualizations of the current crisis, the Anthropocene and climate change, with respect to how they can be deployed to help think about the dynamics of political action.<sup>1</sup>

The term *Anthropocene* suggests that the Holocene, the geological epoch encompassing all recorded human history, has ended and that the earth has entered a new epoch in which humans are altering the environment on a planetary scale. The term was proposed by the chemist and Nobel Prize laureate Paul Crutzen in 2000 and soon began to attract attention in ever wider circles. Discussions on the subject in the humanities took off by the end of that decade, largely spurred by Dipesh Chakrabarty's 2009 *Critical Inquiry*

This essay was written in early 2019. The study was funded by the Swedish Research Council (grant number 2014-01492). Unless otherwise noted, all translations are my own.

1. The following discussion of the Anthropocene temporality treats a variety of titles from the field but does not claim to give a complete overview of the now vast literature on the topic. The discussion centers on Jeremy Davies, *The Birth of the Anthropocene* (Oakland, Calif., 2016); hereafter abbreviated *B.* Davies offers an excellent account of the Anthropocene concept and the disagreements it harbors. This book is also one of the most ambitious attempts to use the Anthropocene for framing a political understanding of our moment in time. But as such it inevitably also exemplifies the politically problematic temporal structure of the Anthropocene. The discussion of climate change temporality builds on articles on climate change in scientific publications but is primarily based on two recent reports published by the Intergovernmental Panel on Climate Change (IPCC); see *Climate Change 2014: Synthesis Report*, ed. Rajendra K. Pachauri and Leo Meyer (Geneva, 2014), hereafter abbreviated *CC*; and *Global Warming of 1.5°C*, ed. Valérie Masson-Delmotte et al. (Geneva, 2018), [www.ipcc.ch/sr15/](http://www.ipcc.ch/sr15/)

article.<sup>2</sup> In 2014 it received an entry in the *Oxford English Dictionary* (see B, p. 56). The interest for the Anthropocene within the social sciences, the arts, and the humanities is growing by the day; what was once a geological concept is now arguably outgrowing its status as a trending buzzword and on its way to becoming the dominating framework for thinking about and discussing the mounting environmental crisis of our time.

The climate change concept is of an older date. The scientific study of the concentration of gases in the atmosphere and the possible ramifications for global temperature started in the late nineteenth century.<sup>3</sup> The current position of climate change in international politics is however of a much later date. The most authoritative and influential institution for synthesizing and communicating climate science results today, the UN Intergovernmental Panel on Climate Change (IPCC), was founded in 1988.<sup>4</sup> Among scholars in the humanities in recent years, the interest in climate change has arguably been overshadowed by the more charismatic Anthropocene concept.

There are many differences and asymmetries between climate change and Anthropocene as concepts. They emerged in different historical contexts; they are underpinned by different, if sometimes overlapping, academic disciplines, institutions, and epistemic communities; and they build on and group together different but partly overlapping phenomena. They are also asymmetrical in the sense that many discussions of the Anthropocene (including many of those treated in this article) include climate change and models from climate science. Nevertheless, both concepts figure in public debates, both internationally and in several national contexts, as alternative and competing conceptions of the ongoing environmental crisis, and it is as such that they can be compared. The stakes of their respective positions in these debates are high,

2. See Dipesh Chakrabarty, "The Climate of History: Four Theses," *Critical Inquiry* 35 (Winter 2009): 197–222.

3. See Paul N. Edwards, *A Vast Machine: Computer Models, Climate Data, and the Politics of Global Warming* (Cambridge, Mass., 2010), pp. 72–76.

4. See David Archer and Stefan Rahmstorf, *The Climate Crisis: An Introductory Guide to Climate Change* (New York, 2009), p. 2; for an overview of the emergence of climate change as a scientific and political issue, see chap. 1. See also Dale Jamieson, *Reason in a Dark Time: Why the Struggle against Climate Change Failed and What It Means for Our Future* (New York, 2014), chap. 2.

JULIA NORDBLAD is associate senior lecturer at the Department of History of Science and Ideas at Uppsala University. During spring 2018 she was a visiting fellow at the Max Planck Sciences Po Center on Coping with Instability in Market Societies in Paris. She works on different historical aspects of the contemporary ecological crisis and is currently working on the history of ecological economics.

as they frame public understanding of the crisis as well as the cultural and political discussions and debates in different ways. It is a main argument of this article that this difference in political characteristics is due to their different temporalities.

Time is central to politics: it is crucial to how phenomena are conceptualized as public issues and to how narratives are used to raise public awareness. In the political process time is simultaneously resource and restraint.<sup>5</sup> Especially important for the purpose of constructing political possibilities is the way the future is conceptualized. For political possibility to be discernible, some sense of openness of the future is required. If the future is already determined, there is no space for imagining, creating, planning, or deliberating, and this stifles political thought.

The Anthropocene and climate change imply two different temporal frameworks, both shaping the way anthropogenic environmental degradation is thought of and debated politically.<sup>6</sup> The temporalities of the Anthropocene and climate change offer different answers to questions such as: What are the temporal characteristics of the environmental crisis of our time? What is at risk? And what are the political ramifications of the answers to these questions? The different temporal structures implied in the alternative conceptions of the current environmental predicament shape the possibilities for political understanding and deliberation of fundamental political issues such as: What kind of future would be a good and possible one? Why? And how could it be realized? The main argument of this article is that the temporal characteristics of the Anthropocene concept renders it unhelpful for thinking critically about how the current environmental crisis can be addressed and for forging political action. It is climate change that offers the more useful framework for thinking and ultimately acting politically.

### **Anthropocene Temporality: Politics in the Future Perfect**

With its growing popularity, the existing versions of the Anthropocene concept have multiplied, as have the controversies between their advocates. Most versions nevertheless share some core characteristics, not least with

5. See Kari Palonen, "Political Times and the Rhetoric of Democratization," in *The Ashgate Research Companion to the Politics of Democratization in Europe: Concepts and Histories*, ed. Palonen, Tuija Pulkkinen, and José María Rosales (New York, 2008), pp. 151–65, and Pierre Rosanvallon, *Pour une histoire conceptuelle du politique* (Paris, 2003), p. 32.

6. To be clear, this is in no way an argument regarding the scientific basis of the two concepts, it is a comparative discussion about their respective usefulness for thinking politically about the environmental crisis of our time.

respect to temporality. The Anthropocene concept is the name of a proposed new geological epoch, currently undergoing formalization within the International Commission on Stratigraphy. The proposal rests on the suggestion that human impact on the planetary systems has now reached an amplitude that will leave “anthropogenic signatures in the geological record.”<sup>7</sup> By its very name and claim, the Anthropocene in other words evokes long-term, geological, or deep time. But precisely how does it engage with this timescale? What is the temporal structure of the Anthropocene?

The signature characteristic of the Anthropocene concept shaping its temporal character is that it is declared from an imagined point in a future millions of years from now (see *B*, pp. 76–110).<sup>8</sup> Geologically, the Anthropocene is defined by “all those changes to the earth that might be discernible in the distant future, because of the way in which they alter the layers of sediment and snow that will be stacked and compressed into rocks and ice sheets” (*B*, p. 77).

Geologists “consider contemporary environmental trends in stratigraphic terms, for instance, translating landscape modification (including urban growth) as a new lithostratigraphic signal, and biodiversity change as the fossil record of the future.”<sup>9</sup> As an example, “ocean acidification alone may substantially change marine ecosystems over the next century, contribute to global biodiversity decline, and so produce a distinctive event in the future fossil record.”<sup>10</sup> Interestingly, the trope of the thought experiment is not new: the Italian geologist Antonio Stoppani suggested a version of the future geological gaze on the present already in 1873.<sup>11</sup>

To think about our present from the point of view of the traces left of it in future rocks is apparently an intriguing thought experiment. It has been picked up and used in accounts of and discussions about the Anthropocene

7. Simon L. Lewis and Mark A. Maslin, “Defining the Anthropocene,” *Nature*, 11 Mar. 2015, p. 171. The Anthropocene concept’s history is closely connected to the relatively new discipline of earth system science, and to the research program International Geosphere-Biosphere Programme (IGBP) founded in 1987. See Sébastien Dutreuil, “Gaïa: Hypothèse, programme de recherche pour le système terre, ou philosophie de la nature?” (PhD diss., Université Paris 1 Panthéon-Sorbonne, 2016), p. 605, and Erle C. Ellis, *Anthropocene: A Very Short Introduction* (New York, 2018), pp. 29–32.

8. The perspective has been developed most extensively in Jan Zalasiewicz, *The Earth after Us: What Legacy Will Humans Leave in the Rocks?* (New York, 2008).

9. Zalasiewicz et al., “The Anthropocene: A New Epoch of Geological Time?” *Philosophical Transactions: Mathematical, Physical and Engineering Sciences* 369 (Mar. 2011): 839.

10. *Ibid.*, p. 837.

11. See Antonio Stoppani, *Geologia Stratigrafica*, vol. 2 of *Corso di Geologia* (Milano, 1873), p. 740, and Etienne Turpin and Valeria Federighi, “A New Element, A New Force, A New Input: Antonio Stoppani’s Anthropozoic,” in *Making the Geologic Now: Responses to Material Conditions of Contemporary Life*, ed. Elizabeth Ellsworth and Jamie Kruse (New York, 2013), pp. 34–41.

far beyond the geological scientific community. It is often used to produce a striking *Verfremdungseffekt*, shining light on astonishing aggregated effects of late-twentieth and early-twenty-first century cultures, with their mind-boggling scale of reorganization and displacement of matter across the globe. For example, according to David Farrier: “some 60 billion chickens are killed for human consumption each year; in the future, fossilized chicken bones will be present on every continent as a testimony to the intrusion of human desires in the geological record.”<sup>12</sup> The point of view of a future scientist was also a central narrative device in the BBC series *The Age We Made* from 2012, asking the listeners questions such as “how might manufactured goods such as mobile phones and plastic bottles become fossilized in millions of years? What will remain of our cities?”<sup>13</sup> The program series discussed issues like the risk of tens of meters of sea-level rise but exclusively from the angle of how it would appear to a future scientist. What is at stake in the current situation seems to be the nomenclature of geologists, a million years into the future.

The point of view from the distant future often works as a morally charged gaze highlighting perverse effects of the consumerist way of life dominating aspirations in the early twenty-first century. But the trope also carries other implications. The positing of “anthropogenic signatures in the geological record” presupposes a point in the distant future when these signatures will be deciphered and somebody is capable of deciphering them. There is a contradiction here. The signature scientific illustration of the Anthropocene is the so-called hockey stick curves, showing the steep growth pattern of everything from human population, carbon dioxide concentration in the atmosphere, water and fertilizer consumption, the number of McDonald’s restaurants in the world, and the number of species going extinct.<sup>14</sup> If some of these curves don’t bend soon, no future geologist is likely going to be there to receive the testimony of the fossilized chicken bones. Geologists are not just any type of humans but a highly specialized species, perfectly but exclusively adapted for a narrow ecological niche that is possible only in societies with a fine-meshed division of labor, in which harvests and institutions are relatively stable, law rules rather than warlords, and where

12. David Farrier, “How the Concept of Deep Time Is Changing,” *The Atlantic*, 31 Oct. 2016, [www.theatlantic.com/science/archive/2016/10/aeon-deep-time/505922/](http://www.theatlantic.com/science/archive/2016/10/aeon-deep-time/505922/)

13. Gaia Vince and Andrew Luck-Baker, “The Age We Made,” *BBC*, 18 Nov. 2012, [www.bbc.co.uk/programmes/p0104klm](http://www.bbc.co.uk/programmes/p0104klm)

14. See, for example, Will Steffen et al., “The Anthropocene: Conceptual and Historical Perspectives,” *Philosophical Transactions: Mathematical, Physical and Engineering Sciences* 369 (Mar. 2011): 851–52, and Christophe Bonneuil and Jean-Baptiste Fressoz, *L’événement Anthropocène: La terre, l’histoire et nous* (Paris, 2016), pp. 24–25.

might makes right is an invective for essays in the culture section, not the dominating *modus operandi* of society.<sup>15</sup> Contradictorily, the Anthropocene is proclaimed from a future that is possible only if the trends that constitute it are broken. (As Irwin Corey has phrased it, “if we don’t change direction soon, we’ll end up where we’re going.”)<sup>16</sup> Human impact on the Earth system does not equal human control over said system. In fact, among the versions of the future geological account that are being discussed, the Anthropocene might soon lose the cunning critters that named it: as Davies notes, “*Homo sapiens* may well disappear from the fossil record somewhere in its lower reaches” (B, p. 85).

The future geologist is of course a thought experiment and not a prediction (sometimes the individual in question is even cast as an alien arriving to earth from outer space), so criticizing it for its implausibility is somewhat beside the point. Nevertheless, this temporal setup has consequences for the overall conceptualization of our environmental situation that the Anthropocene promotes. The Anthropocene encourages us to look at our time and societies from afar, but the gaze of the future geologist is not a political one. By presupposing continuity, it fails to specify what is at risk, namely the very environmental, and thus societal, conditions that make human activities such as science possible.

Another problem with the Anthropocenic gaze from a vertiginously distant future is that it risks cultivating disengagement. It casts greenhouse gas emissions, species extinction, and nuclear bomb tests as phenomena of the same kind as plate tectonics or even the eventual implosion of the sun—fascinating and chilling, but hardly potential objects of political mobilization. The Anthropocene temporality conceptualizes the present in such a low resolution that the difference between life or death for generations and nations, species and habitats looks strangely indifferent. What does it really matter, in a million years, if sea levels rise abruptly by the end of the twenty-first century or slowly, starting, say, twenty centuries later? Fressoz argues that the Anthropocenic perspective evokes the sublime, the same mix of terror and pleasure that we experience before nature when it at the same time outsizes us and strikes us with awe. In the long term, this effect fosters dismay

15. Davies makes a similar point when he eloquently notes that the Holocene “is the only geological epoch so far in which there have been symphony orchestras and hypodermic needles, moon landings and gender equality laws, patisseries, microbreweries, and universal suffrage—or, to put it plainly, the agricultural civilizations that eventually made all of those things possible” (B, p. 5).

16. Quoted in Dale Jamieson and Bonnie Nadzam, *Love in the Anthropocene* (New York, 2015), p. 5.

and cynicism and clears the way for the same forces that caused the crisis in the first place.<sup>17</sup>

The advocates of the Anthropocene underline its usefulness for raising awareness and enticing public debate. Davies argues that the Anthropocene can have a mobilizing effect by shocking people into understanding the impact of the present on the geological future (see *B*, p. 194). Along somewhat similar lines, Michael Northcott claims that the proclamation of the Anthropocene can function as a *kairos*, a rhetorical moment and call to action to limit human damage to the planet and all the suffering it causes.<sup>18</sup> The concept has undoubtedly attracted public attention, and it is plausible that it has contributed to raising awareness about the global environmental situation in a general sense. Certainly, it has quickly generated a vast literature in the humanities and social sciences, shedding new light on classical issues and raising some interesting new ones. The debates about when the Anthropocene started—and whether it is humanity, capitalism, or something else that should be seen as the principal agent in its emergence—have been enlightening but are at this point quite well-rehearsed (see *B*, pp. 41–68).<sup>19</sup> The Anthropocene may have offered new perspectives, but what it helps us identify as at risk is, in political terms, rather vague. According to Erle C. Ellis, “what’s at stake, outside the domains of geology and stratigraphy, is a new account of our place in nature, our relationship with the rest of planet,”<sup>20</sup> or, in Nigel Clark’s words, the Anthropocene is “about the decentering of humankind” as well as “about our rising geological significance.”<sup>21</sup> On the whole, the Anthropocene concept has generated little constructive and illuminating thought and discussion on how the environmental problems can be understood and addressed politically, and, in this sense, it has not been particularly useful as a political concept.<sup>22</sup> This unhelpfulness is, I argue, an effect of the temporal

17. See Fressoz, “L’anthropocène et l’esthétique du sublime,” in *Sublime: Les tremblements du monde*, ed. Hélène Guenin (Metz, 2016), pp. 44–49 and “Désintellectualiser la critique est fondamental pour avancer,” *Ballast*, 18 June 2018, [www.revue-ballast.fr/jean-baptiste-fressoz-desintellectualiser-la-critique-est-fondamental-pour-avancer/](http://www.revue-ballast.fr/jean-baptiste-fressoz-desintellectualiser-la-critique-est-fondamental-pour-avancer/)

18. See Michael Northcott, “Eschatology in the Anthropocene: From the Chronos of Deep Time to the Kairos of the Age of Humans,” in *The Anthropocene and the Global Environmental Crisis: Rethinking Modernity in a New Epoch*, ed. Clive Hamilton, François Gemenne, and Christophe Bonneuil (New York, 2015), p. 109.

19. For critical and clarifying overviews of these issues, see Chakrabarty, “Anthropocene Time,” *History and Theory* 57 (Mar. 2018): 5–32.

20. Ellis, *Anthropocene*, p. 144.

21. Nigel Clark, “Geo-Politics and the Disaster of the Anthropocene,” *The Sociological Review* 62 (June 2014): 25.

22. At times, innovative and enlightening political analyses of our current predicament have indeed been presented under the heading of the Anthropocene. But regardless of the title, it is when these analyses have in effect engaged directly with the findings of climate science that they have been politically pertinent and innovative. Due to the overlap and asymmetry between the



structure of the Anthropocene concept. That temporal structure is also the reason behind the specific shortcoming of the Anthropocene debate, identified by Chakrabarty as an apparent difficulty to connect human-historical time with the time of geology and to develop “a mode of thinking about the present that would attempt to hold together these two rather different senses of time.”<sup>23</sup>

The most troubling effect of the Anthropocene temporal structure is that it suggests that the future is already determined. A recurring trope in the discussion is that the Anthropocene constitutes a clash, rupture, or transition between two epochs.<sup>24</sup> Davies argues that we are currently caught in between two geological intervals, the Holocene and the Anthropocene, and the main task for environmentalist political thought is therefore to “negotiate a way through this transition” (B, p. 6). The problem with conceptualizing the Anthropocene in terms of a transition is that it suggests that the main challenge ahead is to trace the itinerary from one predetermined state to another, rather than to think about what kind of futures would be desirable, why, for whom, and how they could be made possible.

Further, by envisioning the present from a point in the future, the Anthropocene concept outlines the fundamental environmental processes and events not only of the present but also, without openly stating it, of the future. The Anthropocene is declared in the future perfect, as that which will have occurred.<sup>25</sup> This means that it places the past and the future in the same category, because from the point of view of the future geologist they are both equally past. This predictive determinism is profoundly unfortunate as a political temporality because it blurs the line between past events and events that are still avoidable (albeit with a great, perhaps unprecedented, political effort). The path forward of several key indicators of the Anthropocene are not determined—the current wave of species extinction is one of them (as Davies himself points out), climate change another—in important ways,

---

two concepts of climate change and Anthropocene, most of the time no clear distinction is made between the two. See for example Chakrabarty, “The Politics of Climate Change Is More than the Politics of Capitalism,” *Theory, Culture & Society* 34, nos. 2–3 (2017): 25–37, and Timothy Clark, *Ecocriticism on the Edge: The Anthropocene as a Threshold Concept* (New York, 2015).

23. Chakrabarty, “Anthropocene Time,” p. 5.

24. See Stefan C. Aykut and Amy Dahan, *Gouverner le climat?: Vingt ans de négociations internationales* (Paris, 2015), p. 579.

25. Jean-Pierre Dupuy’s concept of enlightened doomsaying is an interesting example of how the future perfect perspective can be developed into something more precise and fruitful. Dupuy suggests an imaginary retroactive perspective from a future in which the worst has already happened. The goal of this is to open the possibility of steering away from precisely that course of events. One of the points of that operation, according to Dupuy, is to make the unthinkable thinkable and credible, and thus overcome the mental blockage that radical events present to the collective imagination; see Jean-Pierre Dupuy, *Pour un catastrophisme éclairé: Quand l’impossible est certain* (Paris, 2002). See also Aykut and Dahan, *Gouverner le climat?* chap. 11.



the endpoint of the current confluence of environmental crises is not set (see B, p. 89).<sup>26</sup> But the Anthropocene perspective does not shine any light on this situation, which is characterized by being both open and decisive. By collapsing the difference between what has happened and what is yet avoidable, it fails to open space for imagining, planning, critically discussing, or deliberating the future. In sum, the Anthropocene, with its starting point in a distant future in which all important events have already taken place, is thus of little help for understanding what is at stake for politics in the current crisis. Treating the future as the past in effect means to end all openness of the future and thereby to stifle political thought and creativity.

### Climate Change Temporality: Alternative Futures in a Complex System

I now turn to the climate change concept as a temporal framework for thinking politically. Two characteristics of climate change are especially important for its temporality: first, that it is presented in the form of alternative scenarios for the future; second, climate is conceptualized as a complex system.<sup>27</sup> The leading actor in shaping the concept is the IPCC, which collects, synthesizes, and communicates results from international climate science. In its reports, the IPCC integrates a vast number of scenarios and narratives for the future, as well as results from simulations of future developments (of very different phenomena, such as precipitation patterns, changes in GDP, and so on). The results from the syntheses are then presented in the form of alternative pathways for the future.<sup>28</sup> The reports in other words

26. See Peter U. Clark et al., "Consequences of Twenty-First-Century Policy for Multi-Millennial Climate and Sea-Level Change," *Nature Climate Change* 6 (Apr. 2016): 360–69.

27. Because there are other greenhouse gases than carbon dioxide, the term *carbon dioxide equivalents* is often used in more technical contexts. For the purposes of this article such precision is unnecessary, and I therefore use the terms *greenhouse gases* and *carbon dioxide* synonymously.

28. In the IPCC reports and in the climate science community at large a precise terminology has been established that specifies the difference among such terms as *scenarios*, *pathways*, and *projections* and a plethora of subcategories. In this essay, I do not take into account the differences and relationships between terms like *scenario* and *pathway* as they are used in the technical literature, but use them in a more general sense sufficient for my purposes. For a general and introductory orientation in the climate change terminology, see "2018: Annex I: Glossary," ed. J. B. Robin Matthews et al., in *Global Warming of 1.5°C*. For comprehensive studies of climate modelling and how climate scenarios are constructed, see for example Edwards, *A Vast Machine*, and Béatrice Cointe, Christophe Cassen, Alain Nadaï, "Organising Policy-Relevant Knowledge for Climate Action: Integrated Assessment Modelling, the IPCC, and the Emergence of a Collective Expertise on Socioeconomic Emission Scenarios," *Science & Technology Studies* 32 (Dec. 2019), [scientechnologystudies.journal.fi/article/view/65031](https://scientechnologystudies.journal.fi/article/view/65031)

compare and discuss different futures and under what conditions they would be realized.

In its 2014 synthesis report, the IPCC presented a new scenario model, the Representative Concentration Pathways (RCP).<sup>29</sup> Covering the range of possible outcomes for the year 2100 according to the available scientific literature, the RCP model provides four alternative pathways for the twenty-first century, each tracing an itinerary for the concentration levels of greenhouse gases and the estimated rise in temperature.<sup>30</sup> The term *representative* means that each pathway is one of several possible scenarios with similar emission values, computed by climate modelers at different scientific institutions.<sup>31</sup> Of the four RCPs, one is a “stringent mitigation scenario,” which is likely to keep global warming below 2 degrees Celsius compared to pre-industrial temperatures; one is a very high emission scenario; and the remaining two are intermediate scenarios (CC, p. 8). The RCPs were developed to provide a standard for climate modelers.<sup>32</sup> They also structure the IPCC’s 2014 report, including its communication with policy makers and the general public. The 2018 special report instead departs from two different levels of global warming by 2100: 1.5 degrees Celsius and 2 degrees Celsius. The task for the report was to examine the two levels of warming specified in article 2 of the Paris Agreement, which states that the signatories should “strengthen the global response to the threat of climate change” by “holding the increase in the global average temperature to well below 2 degrees Celsius above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5 degrees Celsius above pre-industrial levels.”<sup>33</sup> The report compares 1.5 degrees Celsius and 2 degrees Celsius with respect to their impacts as well as the different pathways that might lead to them.

In different ways, both the RCPs in the 2014 report and the political temperature goals in the 2018 report open up alternative futures: different scenarios are imagined, modelled, projected, and those can be debated, compared, and deliberated.<sup>34</sup> The temporalities of the reports on climate change

29. See Richard Moss et al., *Towards New Scenarios for Analysis of Emissions, Climate Change, Impacts, and Response Strategies* (Geneva, 2008), p. 4.

30. See Detlef P. van Vuuren et al., “The Representative Concentration Pathways: An Overview,” *Climatic Change* 109 (Aug. 2011), p. 5.

31. See IPCC, “2014: Annex II: Glossary,” ed. Katharine J. Mach, Serge Planton, and Christoph von Stechow in CC, p. 126.

32. See van Vuuren et al., “The Representative Concentration Pathways: An Overview,” p. 6.

33. United Nations, *Paris Agreement*, 22 Oct. 2018, Paris, [unfccc.int/resource/docs/2015/cop21/eng/10a01.pdf](https://unfccc.int/resource/docs/2015/cop21/eng/10a01.pdf), p. 22.

34. As an example, the IPCC estimates that up to ten million fewer people would be exposed to risks related to sea level rise if global warming is limited to 1.5 degrees Celsius instead of 2 degrees Celsius; and that limiting global warming to 1.5 degrees Celsius, compared with 2 degrees Celsius could reduce “the number of people both exposed to climate-related risks and

thus constitute potential (and actual) starting points for thinking politically about the matter. The reports also, in different ways, establish that current trends are not reassuring but that there is a possibility to substantially affect the level of global warming and its effects.<sup>35</sup>

The different futures presented in the reports are certainly a productive starting point for thinking politically about the environmental situation but should not be understood as full-fledged political alternatives.<sup>36</sup> The scenarios and pathways in the IPCC reports are complex combinations of socio-economic and physical projections and modellings, and there are several problems associated with them as political conceptualizations of the future. As an example, it is difficult for scholars in other disciplines, as well as for politicians and the public, to understand precisely what different scenarios represent in terms of the necessary measures to achieve them and what presumptions they rest on.<sup>37</sup> One such presumption is the reliance on so-called negative emissions in the scenarios of the 2018 special report (see “SP,” pp. 16, 19). Negative emissions refer to removal of carbon dioxide from the atmosphere through technical methods yet to be developed.<sup>38</sup> Scholars have argued that neither policy makers nor the public have understood the extraordinary conditions of the lower emissions pathways, especially with respect to land use and the reliance on specific and successful future technological development.<sup>39</sup> Oliver Geden argues that the introduction of negative emissions in the calculations used in the IPCC’s 2014 report “allows for masking the growing inconsistency between political talk, decisions, and actions.”<sup>40</sup> To rely on nonexistent technologies means “establishing a kind of carbon debt to be paid back later in the century,” although none of the measures necessary

---

susceptible to poverty by up to several hundred million by 2050,” as well as “the proportion of the world population exposed to a climate change-induced increase in water stress by up to 50%” (IPCC, “2018: Summary for Policymakers,” in *Global Warming of 1.5°C*, pp. 9, 11; hereafter abbreviated “SP”).

35. The 2018 report states that the current emission cuts promised by states would not suffice to limit global warming to 1.5 degrees Celsius, but rather put the world on track for 3 degrees Celsius by the end of the century and continuing afterwards; see “SP,” p. 20. The 2014 report stated that the then current trends put the world on track for a scenario somewhere between the two highest RCPs; see *CC*, p. 8.

36. Oliver Geden suggests that the temperature targets should be understood as boundary objects, inherently ambiguous objects of interaction and negotiation between different networks. See Oliver Geden, “The Paris Agreement and the Inherent Inconsistency of Climate Policymaking,” *WIREs Climate Change* 7 (Nov./Dec. 2016): 791.

37. See *ibid.*

38. See Kevin Anderson and Glen Peters, “The Trouble with Negative Emissions,” *Science*, 14 Oct. 2016, p. 182.

39. See Geden, “The Paris Agreement and the Inherent Inconsistency of Climate Policy-making.” See also Anderson and Peters, “The Trouble with Negative Emissions.”

40. Geden, “The Paris Agreement and the Inherent Inconsistency of Climate Policymaking,” p. 793.

to make repayment of the debt possible are being taken.<sup>41</sup> Further, because the RCPs represent future greenhouse gas concentrations in the atmosphere, they are based on estimations about the factors that drive emissions, such as “population size, economic activity, lifestyle, energy use, land use patterns, technology and climate policy” (CC, p. 8). The scenarios thus blend modellings of the climate system’s reaction to different concentrations of greenhouse gases in the atmosphere with political, social, and economic presumptions about the future. In this way, “potentially contestable choices for climate futures are woven into the technical elaboration of alternative pathways.”<sup>42</sup> From a critical point of view, this can be understood as a depoliticization of political and economic assumptions and values.

Clearly, the alternative futures in the IPCC reports are neither to be understood as neutral facts, devoid of politics, nor as ready-made political alternatives. Nevertheless, the basic structure of a range of alternatives for the future is crucial for a political temporality. It establishes a temporal structure that opens the present to different potential futures and manifests the fact that the level of emissions in the coming decades is decisive for future climate change but not yet determined.<sup>43</sup> The temporal structure of climate change is in this way useful for the purpose of thinking politically about the environmental crisis and for deliberating on how to take action.

The second distinctive feature of climate change temporality is complexity. Climate science conceptualizes global climate as a system made up of “five major components: the atmosphere, the hydrosphere [all water on earth], the cryosphere [the places on earth where water appears as ice], the lithosphere [the earth’s hard, outer layer] and the biosphere [all ecosystems], and the interactions between them.”<sup>44</sup> The system they form is complex, as distinct from complicated, and the relation between causes and effects is neither linear nor proportional. That climate is complex means that it does not resemble a machine in which mechanisms and outcomes can be fully predicted but a system which displays chaotic and erratic behavior, in which small alterations may have unexpected and far-reaching effects and in which change can be sudden and irreversible.<sup>45</sup> The climate system is also characterized by inertia. Effects

41. Ibid.

42. Silke Beck and Martin Mahony, “The IPCC and the Politics of Anticipation,” *Nature Climate Change* 7 (May 2017): 312.

43. This is underlined in Archer and Rahmstorf, *The Climate Crisis*, p. 126.

44. IPCC, “2018: Annex I: Glossary,” p. 121.

45. See Alfons P. M. Baede et al., “The Climate System: An Overview,” in *Climate Change 2001: The Scientific Basis. Contribution of Working Group I to the Third Assessment Report of the Intergovernmental Panel on Climate Change*, ed. John T. Houghton et al. (New York, 2001), p. 91.

of emissions today typically appear with a considerable time lag, as phenomena like ocean temperature, sea level rise, and shifting biomes all have their own “intrinsic long timescales which will result in changes lasting hundreds to thousands of years after global surface temperature is stabilized” (CC, p. 16).

Climate system complexity entails that the different pathways or alternatives for the future laid out in the IPCC reports imply different temporalities. The difference between them is not only a matter of effects but also of the speed of change. For example, in both scenarios in the 2018 report, the “sea level will continue to rise well beyond 2100,” but “the magnitude and rate of this rise depend on future emission pathways” (“SP,” p. 7). But there are even more important differences between the scenarios’ temporalities. One aspect of climate complexity with particularly important consequences for the political temporality of climate change is that the climate system contains thresholds or tipping points. Beyond these thresholds, the system reorganizes, “often abruptly, and does not return to the initial state even if the drivers of the change are abated” (CC, p. 128). Change in the climate system does not proceed gradually and in proportion to the emissions but can be abrupt, dramatic, and impossible to undo. The implication of this is that not even a radical global cut in greenhouse gas emissions would halt some of the processes in the climate system once they have started. The risk of reaching such tipping points increases with a higher temperature rise and thus varies among different scenarios in the reports. There is much insecurity associated with the locations of different tipping points, but the IPCC concludes that the risk for “large scale singular events,” for example irreversible loss of ice from the Greenland ice sheet, “that are thought to hold the risk of reaching critical tipping points under climate change, and that can result in or be associated with major shifts in the climate system,” is moderate at 1 degree Celsius of warming, and high at 2.5 degrees Celsius.<sup>46</sup>

In temporal terms, climate change can enter into what I call a temporality of unfolding, a mode in which game-changing events have taken on their own momentum and proceed beyond human influence, let alone human control.<sup>47</sup> The high emission scenarios are more likely to enter into a temporality of unfolding, hardwiring the political future of future generations for more climate change. Another way of understanding the difference between the scenarios is that the high-emission scenarios that set in motion a temporality

46. Ove Hoegh-Guldberg et al., “Impacts of 1.5°C Global Warming on Natural and Human Systems,” in *Global Warming of 1.5°C*, p. 257.

47. See Susan Solomon et al., “Irreversible Climate Change due to Carbon Dioxide Emissions,” *Proceedings of the National Academy of Sciences of the United States of America* 106 (Feb. 2009): 1709.

of unfolding also extend the present generation's power into the future on a scale hitherto unknown in human history, determining conditions on earth for innumerable generations to come.<sup>48</sup> In this way, the different scenarios to different degrees activate the geological timescale.

If the Anthropocene invokes geological time by simply zooming out, climate change details the specific structure connecting our political present with the perplexingly long term. The temporality of climate change thus gives us a framework for thinking about the geological time scale in a way that makes political sense today.

### The Open Future as a Finite Resource

In its 2014 report, the IPCC warns that the high emission pathways risk bringing a situation in which "common human activities, including growing food and working outdoors" are compromised (as projected for the highest RCP) and to which the potential for adaptation is very limited (CC, p. 15). But the hardwiring of future climate change also undermines a core political value, namely that of the open future. The open future as a condition for politics, especially democratic politics, is an important (if somewhat under-explored) theme in the theory and history of democratic political thought.<sup>49</sup> The issue of the open future is intertwined with the power asymmetry structuring intergenerational relations. Present people exercise an extensive power over future people, who lack a voice in decisions that profoundly affect them.<sup>50</sup> This power can be exercised for example by the exploitation of scarce resources or by the use of potentially harmful technologies. Bernadette Bensaude-Vincent has argued that present people are in effect colonizing future generations by the use of technologies and materials with transgenerational life cycles and harmful consequences in the future, such as plastic and nuclear power.<sup>51</sup>

48. See, for example, Clark et al., "Consequences of Twenty-First-Century Policy for Multi-Millennial Climate and Sea-Level Change," pp. 360–61.

49. Terry Maley has developed this theme in Max Weber's thought, by placing open-ended temporality at the center of his interpretation of Weber's concept of the political; see Terry Maley, *Democracy and the Political in Max Weber's Thought* (Toronto, 2011), chap. 5.

50. See Daniel Innerarity, *The Future and its Enemies: In Defense of Political Hope*, trans. Sandra Kingery (Stanford, Calif., 2012), p. 23; Solomon et al., "Irreversible Climate Change due to Carbon Dioxide Emissions," and Pierre Friedlingstein et al., "Long-Term Climate Implications of Twenty-First-Century Options for Carbon Dioxide emission mitigation," *Nature Climate Change* 1 (Dec. 2011): 457–61.

51. See Bernadette Bensaude-Vincent, "Comment sortir du piège de la flèche du temps?" *Revue Française d'Éthique Appliquée* 2 no. 2 (2016): 93. This can also be thought of in Barbara Adam's terms, as a colonization of time, "the econo-political reach into, as well as the ab/use of" the future, that is, "successors' presents" (Barbara Adam, "Reflexive Modernization Temporalized," *Theory, Culture & Society* 20, no. 2 [2003]: 72). See also Chakrabarty's discussion of the politics

The political relations between generations and the related issue of the open future have attracted political thinkers at several key moments in political modernity. In the late eighteenth century, prominent philosophers such as Marquis de Condorcet, Thomas Paine, and Thomas Jefferson discussed the problem of transgenerational power, and they all emphasized the political freedom of each generation vis-à-vis earlier ones. Every generation is a nation, as Jefferson expressed it, stressing that that each generation must be sovereign and not bound by lingering political decisions. Whereas eighteenth-century thinkers focused on the independence of the living in relation to earlier generations, the most pressing problem today is the relation between living and future people.<sup>52</sup> Daniel Innerarity has emphasized the important role played by the future in our individual and collective lives, and in doing so he echoes post-war European political thinkers such as Hannah Arendt, Hans Jonas, and Fred Polak, who in different ways developed the idea that having and imagining a future was of existential importance to both individuals and societies.<sup>53</sup> But what does having a future mean? Gary Saul Morson's distinction between a closed temporality that proceeds as unfolding and an open temporality that harbors alternatives and possibilities and in which time is a process of becoming is helpful for thinking about the open future as a democratic value.<sup>54</sup> That it is crucial to "to keep options open for future generations" was also stressed in the World Commission on Environment and Development's 1987 report (often called the Brundtland commission) *Our Common Future*.<sup>55</sup>

The idea of an open future can be thought of as a guiding principle for the political relationship we forge with future generations: that politics in the present must not compromise but preserve the open-ended horizons of the future. Innerarity argues that the influence we now exercise over future generations calls for a new social contract. Such a contractual relation must be conceptualized differently from one between the living, as questions of intergenerational justice "are not resolved with a logic of reciprocity, but

---

of tipping points in Chakrabarty, "Climate and Capital: On Conjoined Histories," *Critical Inquiry* 41 (Autumn 2014): 7–9.

52. See Innerarity, *The Future and its Enemies*, pp. 13, 16–17.

53. See *ibid.*, p. 108, and Jenny Andersson, "The Great Future Debate and the Struggle for the World," *The American Historical Review* 117 (Dec. 2012): 1424.

54. Although his subject is temporal structures in Russian novels, Morson provides many useful insights for the issue of political temporality; see Gary Saul Morson, *Narrative and Freedom: The Shadows of Time* (New Haven, Conn., 1994), p. 5.

55. World Commission on Environment and Development, *Report of the World Commission on Environment and Development: Our Common Future* (United Nations, 1987), [www.un-documents.net/our-common-future.pdf](http://www.un-documents.net/our-common-future.pdf), pp. [27, 281].



with an ethics of transmission.”<sup>56</sup> But what is it that should be transmitted? The democratic crux with future generations is that, in order to respect their political rights, it does not suffice that legislators in the present consider their interests in the democratic processes and decision making, as that would still mean governing *for* them. Future generations must rule themselves and therefore that which should be transmitted is the possibility for them to do so. This means that what present people owe to future generations is an open future. Setting unstoppable climate change in motion would mean taking away the possibilities and alternatives available to future generations, chaining them to a temporality of unfolding and closing their future.

With unstoppable climate change in motion there would of course remain matters relevant to the public arena that could be treated as political issues. But in a severely climate-changed world hardwired for ever more warming, marked by the deterioration of fundamental conditions (such as rising sea levels, ever larger regions becoming uninhabitable, destabilized conditions for food production, accelerating frequency of extreme weather events), these degrading conditions themselves would not be possible to affect nor meaningfully treat as political issues. In such a world, the very conditions for politics, especially democratic politics, would run a severe risk of deteriorating to a critical degree. Climate change thus clarifies that what is at risk in our time is the open future as a condition for politics as such. This argument can be read in line with Nigel Clark’s suggestion for a way forward in Anthropocene theory, namely to

connect up the question of political possibility with the dynamics and the intransigence of vast domains that are themselves recalcitrant to the purchase of politics. In this way, the Anthropocene—viewed in all its disastrousness—confronts ‘the political’ with forces and events that have the capacity to undo the political, along with every other human achievement, by removing the very grounds on which we might convene and strategize—to the extent of annihilating political beings themselves.<sup>57</sup>

My argument, however, is that it is by engaging with the temporal framework of climate change rather than with that of the Anthropocene that this can be perceived.

I propose that we articulate the open future as a core political value to protect. To this end, the French sociologists Francis Chateauraynaud and Josquin Debaz’s writings are helpful. They suggest the open future as an imperative in the study and production of futures, and they warn against all

56. Innerarity, *The Future and its Enemies*, p. 15, 17.

57. Clark, “Geo-Politics and the Disaster of the Anthropocene,” p. 28.

discourses that create effects of closure (including the Anthropocene).<sup>58</sup> In their view, the future should not be approached as an object of prediction but as a project of imagination and deliberation of a plurality of alternatives, an essentially collective activity of opening possibilities and deliberating ways forward, that they call *prospective*.<sup>59</sup> But Chateauraynaud and Debaz's argument still treats the open future as a matter of perspective to be adopted by the social scientist or political agent. What I propose is something different. In contrast to Chateauraynaud and Debaz's *prospective*, and in contrast to the Anthropocene's future perfect determinism, climate change offers a new way of conceptualizing the open future: not in the eye of the beholder, as a theoretical perspective of choice, but as an empirical question. High emission pathways change the future from an arena of deliberation to a hardwired unfolding of irreversible and unstoppable climate change, in which the open future is shut down. That temporality of unfolding is impending but still avoidable, and, in that sense, the future is still open. Despite the inevitable (but meticulously documented) uncertainties and other shortcomings of climate science, it does render visible that the open future is not a scholarly posture; it is a finite resource.

Some specificity to the way we can understand our relation to the future in the current crisis is offered by the concept of the *carbon budget*, a term widely used in scientific and political discussions on climate change. *Carbon budget* refers to the estimated total amount of greenhouse gases (such as from pre-industrial times and until human net emissions reach zero) that can be emitted if the rise in temperature should be limited to a certain level (see "SP," p. 26). In the 2014 report, the IPCC concluded that to have a likely chance at keeping the increase in temperature below 2 degrees Celsius, the total cumulative amount of greenhouse gas emissions should not exceed a certain number (2900 gigatons of carbon dioxide) (see CC, p. 10). By 2011, two thirds of that amount had already been emitted. The 2018 report lists some adjustments to these numbers, but it does not offer a new systematic assessment of data on the matter or conclude on a new carbon budget (see "SP," p. 14).

58. See Francis Chateauraynaud and Josquin Debaz, *Aux bords de l'irréversible: Sociologie pragmatique des transformations* (Paris, 2017), pp. 139, 142.

59. See *ibid.*, pp. 161, 599, 604–5. Chateauraynaud and Debaz discuss a range of different approaches to the future, among them the *prospective*, that they argue is an idea unique to the French context that was developed in the 1960s as a combination of a scholarly reflection and political institution tied to the philosopher and state official Gaston Berger. For a less enthusiastic analysis of the originality and content of the concept of *prospective*, see Jenny Andersson and Pauline Prat, "Gouverner le 'long terme': La prospective et la production bureaucratique des futurs en France," *Gouvernement et Action Publique* 3 (2015): 9–29, and Vincent Guiader, *Socio-histoire de la prospective: La transformation d'une entreprise réformatrice en expertise d'état* (PhD diss., Université Paris-Dauphine, 2008).

Even if there are several sources of uncertainty associated with such an endeavor, there is clear scientific evidence that cumulative emissions drive climate change and that limiting global warming therefore requires “staying within a total carbon budget” (“SP,” p. 12). With respect to the risk of reaching system-changing tipping points, there is in principle only a limited amount of greenhouse gases that can still be emitted into the atmosphere before climate change becomes hardwired and we enter into a temporality of unfolding. That amount, the remaining carbon budget, corresponds to what is left of the open-ended temporality in which serious unstoppable climate change processes can still be avoided. Framing the matter in this way shows that the open future is a resource that is not only finite but also quantifiable. One of the questions climate change faces us with is how much of that resource people in the present are willing to leave to future generations.

Chakrabarty has noted that the dominating analytical approaches of today’s discussions of the current environmental predicament are taken directly from the scholarly debate about globalization, forged in the social sciences and humanities a couple of decades ago. This is unfortunate, argues Chakrabarty, as the global environmental crisis does not map perfectly on to the analytical maps drawn of globalization.<sup>60</sup> Climate change, for example, plays out as a new dimension of global injustice, one that can be understood in temporal terms. Chakrabarty argues that in the early 1990s, the Indian environmental activists Anil Agarwal and Sunita Narain identified a globalist discourse in the early IPCC reports that professed that all of humanity was in the same predicament with respect to climate change, and they demanded sacrifices from all without taking into account the enormous differences in per capita emissions between countries. This discourse, Agarwal and Narain argued, was in effect a kind of environmental colonialism that served to perpetuate global inequalities. The globalist discourse identified by Agarwal and Narain, Chakrabarty argues, can be understood in temporal terms as an upsetting of the world-historical temporality of modernization and a foreclosure of a future of economic development that poor countries were aspiring to.<sup>61</sup> This is an example of how climate change alters the temporality that framed the scholarly discussions of globalization.

The environmental crisis requires new analytical tools to be properly understood. The conceptualization of the future as a finite resource offers one such tool. Thinking of our moment through the concept of climate change renders visible that, in our time, the open future is to be thought of as one of

60. See Chakrabarty, “The Politics of Climate Change Is More Than the Politics of Capitalism,” p. 25.

61. See Chakrabarty, “Anthropocene Time,” pp. 10–11.

the finite resources that will only get scarcer in the twenty-first century. Climate change makes visible that, alongside land and freshwater, the open future is a resource of which the distribution among countries, classes, genders, individuals, and generations could become a political issue of increasing urgency.

### **The Peculiar Entanglement of Political and Deep Time**

Climate scientists argue that, with strong mitigation efforts in the next few decades, it is still possible to “minimize large-scale and potentially catastrophic climate change that will extend longer than the entire history of human civilization thus far.”<sup>62</sup> Astonishingly, climate science is in this way telling us that the present constitutes a window of opportunity to change the conditions on earth for tens of thousands of years, if not longer.<sup>63</sup> The present sits on a temporal nuclear bomb.

To advance an argument with this dramatic quality has traditionally meant to invite ridicule. As historians and scholars in the humanities, we have been educated to be suspicious of any claim that the time that happens to currently be the present is a particularly and incomparably decisive one. There are indeed good reasons to be sceptic of what Morson calls hypertrophy of the present, the overestimation of one’s own moment in time.<sup>64</sup> Nevertheless, whether the present is in fact decisive or not must ultimately be an empirical question.

The level of climate change is determined by the total amount of greenhouse gases released into the atmosphere, the accumulated emissions “from yesterday, today and those released in the next few years.”<sup>65</sup> In the words of the IPCC, “warming from anthropogenic emissions from the pre-industrial period to the present will persist for centuries to millennia and will continue to cause further long-term changes in the climate system” (“SP,” p. 5). Climate change in this way imposes a temporality of linearity and cumulativeness: future climate change is governed by what has been done in the last two centuries. History imbues the atmosphere in the form of released carbon, or, as Andreas Malm phrases it, “the air is heavy with time.”<sup>66</sup> But future climate change will also—decisively—be determined by what is done in the near

62. Clark et al., “Consequences of Twenty-First-Century Policy for Multi-Millennial Climate and Sea-Level Change,” pp. 360–61.

63. This is also discussed in Andreas Malm, *Fossil Capital: The Rise of Steam-Power and the Roots of Global Warming* (New York, 2016), p. 7.

64. See Morson, *Narrative and Freedom*, pp. 12–13.

65. Kevin Anderson and Alice Bows, “A New Paradigm for Climate Change,” *Nature Climate Change* 2 (Sept. 2012): 639.

66. Andreas Malm, *The Progress of this Storm: Nature and Society in a Warming World* (New York, 2018), p. [4]. See also Malm, *Fossil Capital*, pp. 4–11.

future.<sup>67</sup> The emission levels of the coming decades will in this sense conclude the historical result of the two previous centuries of fossil fuel use. How long the window of opportunity to avoid hardwired long-term climate change remains open depends on the rate of greenhouse gas emissions and for how long emissions continue. A fast net reduction in emissions prolongs the window of opportunity for limiting climate change, continued or rising levels of emissions, or even a too slow rate of reduction will close that possibility.<sup>68</sup> In other words, how long the future remains open depends on the emission pathway taken. The steeper the emission curve goes down, the longer the temporality of unfolding can be staved off. Some pathways keep the window of opportunity for the future open, but others sooner or later lead to a closing of possibilities. This kind of quantified, complex, and plastic decisiveness of the current moment makes it a less fitting target for the accusation of hypertrophy of the present but calls for more attention from scholars of political temporality.

The Anthropocene theorists surely have a point when they radically expand the temporal horizon for politics. There is no doubt that the very long term is entangled with our political present. But the precise mechanics of that entanglement have received far too little attention. According to some climate scientists, it is not only the environmental humanities and social sciences that are guilty of such lack of attention, but climate science as such has not yet explored in any detail how the political temporal horizon of the coming decades is connected with the long-term time frame of the coming millennium.<sup>69</sup> To work these mechanics out, and thus understand the temporal structure of the present crisis and its political implications, the Anthropocene concept is of little help. The way the Anthropocene concept makes us see the present from a geological distance, and its low-resolution optics and peculiar future perfect temporality, provides little clarity on the temporal characteristics of the crisis we are facing, what is at risk, and what this implies for politics.

By contrast, the concept of climate change provides resources for understanding the specific and dynamic entanglement between political time

67. On the greenhouse gases that have been emitted until the present, the IPCC states that “these emissions alone are unlikely to cause global warming of 1.5°C” (“SP,” p. 5).

68. Anderson has underlined the decisive difference in politics between the carbon budget concept and emission reduction goals; see Anderson, “Duality in Climate Science,” *Nature Geoscience* 8 (Dec. 2015): 898–900.

69. According to an article in *Nature Climate Change*, “no studies so far have highlighted how long- (coming millennium) and near-term (coming decades) decisions are intimately connected through the combination of three key factors: (1) how much, (2) how steep, and (3) how soon mitigation will take place” (Friedlingstein et al., “Long-Term Climate Implications of Twenty-First-Century Options for Carbon Dioxide Emission Mitigation,” p. 457).

and the geological future. It renders visible that the open future is a finite resource and part of what is at risk in the current crisis. It opens up the present for different futures and displays that some of them activate much longer time scales and thereby pose greater risks to the open future than others. Climate change thus provides a framework for better understanding the challenges ahead and for thinking politically about them. The construction of a politically useful temporality, one that facilitates both understanding and action, has to begin there.