

# What do we mean when we say climate change is urgent?

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## **Abstract**

*Recent discussions of climate change in multiple domains—the academic literature, the popular press, political movements, and international climate policy regime—have increasingly framed the phenomenon as a “crisis,” an “emergency,” or an “urgent” situation. In this paper, we contextualize the time pressure of climate change in the broader social science literature, perform bibliometric and discourse analyses of this framing, and explore potential implications of this trend for climate decision making.*

*While the increased prevalence of time pressure terms is arguably part and parcel of modernity, these terms are in general not synonymous. In the context of climate decision making, we find that “urgency” functions as a boundary object relaying the internalization of time pressure between (1) the academic literature and the international climate change policy regime and (2) political movements and the popular press; especially as construed in these latter domains, “crisis” and “emergency” connote time pressure but so too generate a constellation of other affective and cognitive states. A review of a set of related literatures suggests that the time pressure framing of climate change affects the quantity and quality of information and the range of options (e.g., geoengineering) considered in choice processes for mitigation and adaptation actions, as well as the sequencing and timing of chosen plan elements; furthermore, these effects likely vary in both direction and magnitude with characteristics of the individuals or organizations in which they manifest. Taken as a whole, the crisis framing of climate change is likely to polarize beliefs and actions, especially in the absence of accompanying information about self-efficacy and hope.*

## **1. Introduction**

Everywhere our world is in “crisis,”<sup>4</sup> a word imbued with an urgency that—like “emergency”—seems uniquely well suited to the temporality of modern life.<sup>5 6 7 8</sup> For some, the ubiquity of crisis has meant its *de facto* normalization;<sup>9</sup> for others, crisis discourse reflects the active

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<sup>4</sup> Koselleck, R. (1988). *Critique and crisis: Enlightenment and the pathogenesis of modern society*. MIT Press.

<sup>5</sup> Arendt, H. (2006 [1960]). The crisis in culture: Its social and its political significance. In *Between Past and Future*. London: Penguin Books. pp. 194–222.

<sup>6</sup> Starn, R. (1971). Historians and ‘crisis’. *Past and Present* 52(1): 3–22.

<sup>7</sup> Holton, R. J. (1987). The idea of crisis in modern society. *British Journal of Sociology*, 502-520.

<sup>8</sup> Roitman, J. (2013). *Anti-crisis*. Duke University Press.

<sup>9</sup> Perrow, C. (1999). *Normal Accidents: Living with High-Risk Technologies*. New York, NY: Basic Books.

construction of society as a “permanent state of exception”<sup>10 11 12 13</sup> steeped in a calculus of risk.<sup>14</sup>

What’s more, there are few domains more “crisis-ridden” than human–environment interaction.<sup>15</sup> Colin Hay writes, presciently, “‘crisis’, whether environmental or ecological, ecosystemic or ecoregional, is perhaps the most ubiquitous concept deployed within the burgeoning environmental and ecological literature.”<sup>16</sup> Climate change, as a global collective action challenge with potentially tremendous material consequences, is a prototypical phenomenon that interlocutors might locate in this discourse.<sup>17</sup>

While there is substantial debate whether the global climate system indeed exhibits a degree of anthropogenic interference that merits the use of various terms that refer to time pressure,<sup>18 19 20</sup> we remain agnostic to this point. Instead, we seek to explore the circuits of meaning organized around these frames and their implications for climate decision making. In section 2, we provide definitions, taking care to distinguish between the various time pressure terms insofar as we find these distinctions illuminating. In section 3, we contextualize the time pressure framing<sup>21</sup> of climate change in the broader social science literature. Section 4 presents the results of a bibliometric and critical discourse analysis of this framing as it manifests across four domains:

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<sup>10</sup> Schmitt, C. (1922). *Politische Theologie: Vier Kapitel zur Lehre von der Souveränität*. Duncker & Humblot.

<sup>11</sup> Benjamin, Walter. (1999 [1968]). *Illuminations*. London: Pimlico Press.

<sup>12</sup> Agamben, G. (1998). *Sovereign power and bare life*. Stanford, Calif: Stanford University Press.

<sup>13</sup> Mbembe, A. & Corcoran, S. (2019). *Necropolitics*. Durham London: Duke University Press.

<sup>14</sup> Beck, U., Lash, S., & Wynne, B. (1992). *Risk society: Towards a new modernity*. Sage.

<sup>15</sup> Only political economy might rival this domain for its proliferation of crisis constructions, as discussed in Jessop, B. (2013). Recovered imaginaries, imagined recoveries: a cultural political economy of crisis construals and crisis management in the North Atlantic financial crisis. In: *Before and beyond the global economic crisis*. Edward Elgar Publishing.

<sup>16</sup> Hay, C. (1996). From crisis to catastrophe? The ecological pathologies of the liberal—democratic state form. *Innovation: The European Journal of Social Science Research*, 9(4), 421-434.

<sup>17</sup> See Ulrich Beck’s critical point that phenomena most deeply conducive to the “crisis theory of social–natural relations” are those “self-generated manufactured uncertainties ... beyond the limit of insurability.” Beck, U. (1999). *World risk society*. Malden, MA: Polity Press.

<sup>18</sup> Risbey, J. S. (2008). The new climate discourse: Alarmist or alarming?. *Global Environmental Change*, 18(1), 26-37.

<sup>19</sup> Ripple, W. J., Wolf, C., Newsome, T. M., Barnard, P., & Moomaw, W. R. (2019). World scientists’ warning of a climate emergency. *BioScience*.

<sup>20</sup> Warner, J., & Boas, I. (2017). Securitisation of climate change: the risk of exaggeration. *Ambiente & Sociedade*, 20(3), 203-224.

<sup>21</sup> While our later discussion handles this in more detail, we clarify at the outset that we understand the time pressure framing of climate change to involve the direct description of climate change as “urgent,” a “crisis,” or an “emergency.” Such description is distinct from a discussion of climate change as, for example, a “catastrophe,” which emphasizes only the magnitude of its effects. It is also distinct from descriptions of the science of climate change or uncertainty associated with it. We believe that time pressure is one of many somewhat distinct and broadly salient terrains of cultural beliefs that can help individuals negotiate meaning—a “frame.” Further, this frame connects with the prevalence of crisis discourse in sensemaking about human–environment interaction. As such, we are interested in the origin and effects of the explicit framing of climate change through the lens of time pressure—the “time pressure framing of climate change.”

articles in academic journals, documents of the international climate change policy regime, articles in the popular press, and statements by political movements directed toward climate action. In section 5, we explore the potential implications for climate decision making of the various ways that actors in these domains construe the time pressure associated with climate change. A short conclusion, section 6, summarizes these sections, indicates that the effects of time pressure are multiple and work in a variety of ways, and calls for fuller and deeper exploration of these topics.

## 2. *Crisis, emergency, and urgency*

We turn first to definitions, noting that “despite, or perhaps because of, [the] pervasiveness [of **crisis**, it] remains one of the most illusive, vague, imprecise, malleable, open-ended and generally unspecified concepts within both the theoreticians’ and the ecologists’ armoury. Indeed, the more one ponders this, the more it seems likely that the term’s ubiquity derives precisely from its notorious imprecision.”<sup>22</sup> Despite a multiplicity of definitions complicating efforts to integrate the crisis literature,<sup>23</sup> crises appear to share at least two features: “First, there is a sequence of events that have created turmoil, instability and/or the conditions for upheaval and dramatic change. Second, this sequence leads to dramatic change.”<sup>24</sup> As a historical object, crisis is a punctuation—a spasm of time that ruptures the *longue durée*<sup>25</sup> and marks a suspension of our steady movement into the future, even as that future foists itself upon us.<sup>26</sup> Crises carry a sense of singularity (else they are simply “normal accidents”<sup>27</sup>) and temporariness (else they become “a general problem”<sup>28</sup>). And while crises imply a turning point, they do not necessarily present a “way out.” Consider the two non-obsolete definitions provided by the Oxford English Dictionary:<sup>29</sup> first, “the point in the progress of a disease when an important development or change takes place,”<sup>30</sup> and second, a “decisive stage in the progress of anything.” Indeed, although the term originates with the Greek *krinô* (to separate, to choose, to decide, to judge), the

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<sup>22</sup> Hay, C. (1999). Crisis and the structural transformation of the state: interrogating the process of change. *The British Journal of Politics & International Relations*, 1(3), 317–344.

<sup>23</sup> McKendree, A. (2011). Synthesizing and integrating the crisis literature: A reflective practice. *The Review of Communication*.

<sup>24</sup> Della Sala, V. (2011). Crisis, what crisis? Narration, crisis and decline in the European Union. EUSA Paper 8F.

<sup>25</sup> Fernand Braudel, a vocal critic of episodic history, opens his retrospective discussion of the Annales school, “There is a general crisis in the human sciences.” Braudel, F., & Wallerstein, I. (2009). *History and the Social Sciences: The Longue Durée*. Review (Fernand Braudel Center), 32(2), 171-203.

<sup>26</sup> To Antonio Gramsci, “crisis consists precisely in the fact that the old is dying and the new cannot be born.” Gramsci, A. (2011). *Prison Notebooks, Volume 2*. Columbia University Press.

<sup>27</sup> Perrow, C. (1999). *Normal Accidents: Living with High-Risk Technologies*. New York, NY: Basic Books.

<sup>28</sup> Carley, K. (1991). Designing organizational structures to cope with communication break-downs: A simulation model. *Industrial Crisis Quarterly* 5: 19–57.

<sup>29</sup> “crisis, n.” OED Online, Oxford University Press, December 2019, [www.oed.com/view/Entry/44539](http://www.oed.com/view/Entry/44539).

<sup>30</sup> This being the dominant meaning of the etymological predecessors of “crisis” for over two millennia (see Roitman, 2013, p. 15).

OED labels two definitions associated with judgement and deliberation as obsolete. What is missing from the broadest modern definition of crisis, then, is agency: while crisis implies decisiveness, it may simply represent a conflict that drives a mechanical—rather than deliberative—response.<sup>31</sup>

“**Emergency**” similarly folds into itself a sense of time pressure, but, as Ben Anderson writes, contains a more profound seed of emancipatory potential:

“The sense of urgency that is part of emergency involves two interrelated temporalities ... The first ... is the time of an omnipresent Present: there is no time except the time of now that requires some form of urgent action ... in emergency the time to act is compressed, and pauses in action supposedly become luxuries that threaten delay. Delay is a risk. There is no time to wait ... ‘claims of emergency’ function through an affect of urgency that forestalls processes of deliberation and dissensus. Democratic procedures and habits become impediments to timely action, since ‘the unspoken presumption is that either one can think or one can act, and given that it is absolutely mandatory that an action be performed, thinking must fall away’<sup>32</sup> ... The second temporality connected to the sense of urgency is ... the interval: the gap or break during which emergency action can still make a difference. If action is decisive and happens at the correct time, then the emergency can be brought to an end without loss, harm or damage. Like the state of exception that is the emergency, the interval is an interruption to linear time: it defines a space-time for action in-between the onset of something new and the temporary stabilization of a changed present.”<sup>33</sup>

That is, while “emergency” constrains communicative rationality, it likewise implies a place for agency in averting some dangerous future.

“**Urgency**,” by contrast, is metonymic: a feature of both “crisis” and “emergency,” it nonetheless does not necessarily import their sense of threat. The psychological literature, for instance, recognizes both positive and negative urgency as motivating action in response to positive and negative affect, respectively;<sup>34</sup> an “urgent” situation may be more an opportunity than a cause for alarm. Its adoption by psychology speaks to another important semantic distinction between “urgency” and “crisis”/“emergency”: while the latter terms describe perceived states of the world, the former is very often proprioceptive—as in a “sense of urgency.” Put differently, urgency—related to the notion of an “urge”—is largely an intrinsic or internal phenomenon, whereas “crisis” and “emergency” are extrinsic or external phenomena that can, under some conditions, elicit internal responses.

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<sup>31</sup> This following the typology set forth in Jones, E. (2006). ‘They have no idea ...’: Decision-making and policy change in the global financial crisis. LSE ‘Europe in Question’ Discussion Paper No. 4. We return to this typology later in our discussion.

<sup>32</sup> Scarry, E. (2011). *Thinking in an Emergency*. New York and London: W. W. Norton.

<sup>33</sup> Anderson, B. (2017). Emergency futures: Exception, urgency, interval, hope. *The Sociological Review*, 65(3), 463-477.

<sup>34</sup> Cyders, M. A., & Smith, G. T. (2008). Emotion-based dispositions to rash action: Positive and negative urgency. *Psychological Bulletin*, 134(6), 807-828. doi:10.1037/a0013341

We briefly note here a fourth term: the **Anthropocene**, a newly-named geological epoch. Like the three terms we consider above, the Anthropocene emphasizes the disruptive nature of climate change, but considers its temporality in a different way. It provides a much broader temporal scale, directing attention backward across decades and centuries to long-established, deeply rooted causes; its forward gaze considers the possibility of a distant future in which we have been forced to address these tensions, though the motivation for and nature of this resolution often remain unspecified.<sup>35</sup> In this way, discussions of the Anthropocene stand in contrast to the focus on immediate action that characterize the other three terms, on which our discussion is centered. For some who draw on the concept of the Anthropocene, the notion of a deliberative escape from the destruction of climate change seems naive at best.<sup>36</sup> Though we share this sense that the challenge of climate change reflects profound structural contradictions, we remain hopeful for the possibility of meaningful, willful response in the present and near future.

The title of this article, which refers to urgency, is chosen carefully, as many of the psychological dimensions of the time pressure of climate action discussed below reflect “urgency” as an internalized crisis or emergency. Throughout our discussion below, then, we seek to draw a link between two things: (1) the social construction of “climate crisis” or “climate emergency” (which we document through an analysis of the ways in which climate change is framed in speech) and (2) the psychological effects of urgency.

### ***3. The social elements of time pressure***

Climate change is a complex, multidimensional phenomenon. As a result, climate decision making demands sensemaking across scales, times, and places, a process that can be particularly difficult for non-expert actors. In such contexts, decision makers often make use of various heuristics, either consciously or unconsciously. Prior experience is one such heuristic: memories help individuals to form expectations that are helpful in guiding action; at the same time, memories can in turn shape individuals’ general impression of objects and events. Individuals may also make use of a frame—“words and nonverbal interactions that help individuals negotiate meaning through the lens of existing cultural beliefs and worldviews”<sup>37</sup>—for example, to distinguish the physical violence of play from the physical violence of aggression.

Generally, framing involves an elevated salience of some aspect of a situation. Communicators, by eliciting a particular frame, can “promote a particular problem definition, causal

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<sup>35</sup> Lewis, S. L., & Maslin, M. A. (2015). Defining the anthropocene. *Nature*, 519(7542), 171-180.

<sup>36</sup> Oreskes, N. & Conway, E. (2014). *The collapse of Western civilization: a view from the future*. New York: Columbia University Press.

<sup>37</sup> Nisbet MC. (2009). Communicating climate change: Why frames matter for public engagement. *Environ. Sci. Policy Sustain. Dev.* 51(2):12–23

interpretation, moral evaluation, and/or treatment recommendation for the item described.” The complexity and structural uncertainties of climate change mean that its contours are, in a sense, open to debate; in such situations, framing is a key element of messaging. In the section that follows, we provide a number of perspectives on the process by which actors across a diverse set of speech domains attempt to make salient and characterize the temporality of climate change through the use of “crisis” or “emergency” framing.

First, we follow recent scholarship in understanding the ontology of “crisis” and “emergency.” That is, while we acknowledge that time pressure events share “real” material qualities, we hold that many of the most important qualities of crisis are subjectively, socially, and discursively constructed<sup>38 39 40</sup> (as opposed to being objective, *a priori*, and material<sup>41</sup>). Numerous authors have demonstrated how the construction of knowledge—especially knowledge about the experience of time—is formed within and interacts with cultural and political contexts.<sup>42 43 44</sup> “Crises are social, political, and cultural phenomena: a crisis is a crisis due to the fact that different groups, interested parties, and institutions perceive and experience it as a crisis,” write Falkheimer and Heide.<sup>45</sup> Berkelaar and Dutta elaborate: “What is and what is not a crisis is situated within the local context and within the meaning structures invoked in these contexts. From a social constructionist perspective, since social reality is communally constructed through language, crises are symbolic and subjective, not simply objective events ... which is to say that what might be considered a crisis in one situation may not be considered a crisis in another.”<sup>46</sup>

Indeed, the construction of crisis is one way through which those with social power can deploy rhetoric to generate action or support for proposed policies.<sup>47</sup> Importantly, however, the definitions, frames, actions, and ‘imagined recoveries’ on which this rhetoric rests are

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<sup>38</sup> Berger, P. & T. Luckmann (1967). *The Social Construction of Reality: A Treatise in the Sociology of Knowledge*. Garden City, NY: Anchor Books.

<sup>39</sup> Orr, J. (1978). How shall we say: ‘Reality is socially constructed through communication?’ *Central States Speech Journal* 29: 263–274.

<sup>40</sup> Searle, J. (1995). *The Construction of Social Reality*. New York: Free Press.

<sup>41</sup> Habermas, Jürgen. *Legitimation crisis*. Boston: Beacon Press, 1975. Print.

<sup>42</sup> Sorokin, P., and R. Merton. 1937. “Social Time: A Methodological and Functional Analysis.” *American Journal of Sociology* 42 (5): 615–629.

<sup>43</sup> Foucault, M. & Sheridan, A. (1972). *The archaeology of knowledge*. New York: Pantheon Books.

<sup>44</sup> Landes, D. (1983). *Revolution in time : clocks and the making of the modern world*. Cambridge, Mass: Belknap Press of Harvard University Press.

<sup>45</sup> Falkheimer, J. & M. Heide (2010). Crisis communicators in change: From plans to improvisations. In W. T. Coombs & S. J. Holladay (eds.), *The Handbook of Crisis Communication*. Hoboken, NJ: Wiley-Blackwell. pp. 511–526.

<sup>46</sup> Berkelaar, B.L. and Dutta, M.J. (2007). *A Culture-centered Approach to Crisis Communication*. Paper Presented at the Annual Meeting of the NCA 93rd Annual Convention; Chicago, IL.

<sup>47</sup> Echoing suggestions, for instance, by Bourdieu that what is at stake in all media discourse is “the imposition of the legitimate vision of the social world.” See: Bourdieu, P. (1991). *Language and symbolic power*. Harvard University Press.

themselves too open to contestation and interpretation.<sup>48</sup> Berkelaar and Dutta continue: “Acknowledging the culturally situated nature of crisis opens us to the possibilities that crises are located within complexly constituted and continuously contested cultural spaces.” Emphasizing the exercise of power in the social construction of crisis—and especially the role of the media as a conduit for this power—we adopt a view of the “making urgent” of climate change that emphasizes the importance of narrative, following influential work by Colin Hay.<sup>49 50 51 52 53</sup> It is illuminating<sup>54</sup> to situate Hay’s framework within Erik Jones’s<sup>55</sup> two-by-two typology of decision making under time pressure, reproduced in Table 1 below.

Table 1: Response modes and stimulus qualities of crisis decision making

		Response mode	
		Mechanical	Rational
Nature of stimulus	Material	<i>Cybernetic</i>	<i>Empirical</i>
	Ideational	<i>Ideological</i>	<i>Narrative</i>

In our understanding, the construal of climate change as a “crisis” or “emergency” involves two processes: first, the translation of artifacts of climate science into the ideational entity “climate change,” and second, the “crisification” of this ideational entity to promote action. The first

<sup>48</sup> De Rycker, Antoon, and Zuraidah Mohd Don. 2013. “Discourse in Crisis, Crisis in Discourse.” In *Discourse and Crisis: Critical Perspectives*, ed. by Antoon De Rycker, and Zuraidah Mohd Don, 3–65.

<sup>49</sup> Hay, C. (1994). Environmental security and state legitimacy. *Capitalism Nature Socialism*, 5(1), 83-97.

<sup>50</sup> Hay, C. (1995). Rethinking crisis: Narratives of the New Right and constructions of crisis. *Rethinking Marxism*, 8(2), 60-76.

<sup>51</sup> Hay, C. (1996). Narrating crisis: the discursive construction of the winter of discontent'. *Sociology*, 30(2), 253-277.

<sup>52</sup> Hay, C. (1999). Crisis and the structural transformation of the state: interrogating the process of change. *The British journal of politics & international relations*, 1(3), 317-344.

<sup>53</sup> Hay, C. (2016). Good in a crisis: the ontological institutionalism of social constructivism. *New Political Economy*, 21(6), 520-535.

<sup>54</sup> De Rycker and Mohd Don, 2013.

<sup>55</sup> Jones, E. (2006). ‘They have no idea ...’: Decision-making and policy change in the global financial crisis. LSE ‘Europe in Question’ Discussion Paper No. 4.



process is well documented.<sup>56 57 58 59 60</sup> In sum, the uncertainty and complexity of global climate models—as well as concerted efforts to cast doubt on climate science<sup>61 62 63 64</sup>—render the perceived materiality of climate change incomplete.<sup>65</sup> Instead, we argue that climate change is constructed as an ideational stimulus through the relay of information across circuits of meaning that link two groups—what Eric Paglia terms “contributory experts” (climate scientists and actors in international climate policy institutions) and “interactional experts”<sup>66</sup> (journalists and activists)—in an extended epistemic community.

The construction of ideational “climate change,” however, is insufficient to motivate what contributory experts judge to be optimal action<sup>67</sup> because, among other things, various features of human psychology lead to a systematic disregard of climate risks. In this vein, some authors highlight that climate change presents a psychologically distant threat—spatially, temporally,

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<sup>56</sup> Hannigan, J. (2014). *Environmental sociology*. Routledge.

<sup>57</sup> Dessai, S., Adger, W. N., Hulme, M., Turnpenny, J., Köhler, J., & Warren, R. (2004). Defining and experiencing dangerous climate change. *Climatic change*, 64(1-2), 11-25.

<sup>58</sup> Dispensa, J. M., & Brulle, R. J. (2003). Media’s social construction of environmental issues: focus on global warming—a comparative study. *International Journal of sociology and social policy*.

<sup>59</sup> Pettenger, M. E. (Ed.). (2016). *The social construction of climate change: Power, knowledge, norms, discourses*. Routledge.

<sup>60</sup> Demeritt, D. (2001). The construction of global warming and the politics of science. *Annals of the association of American geographers*, 91(2), 307-337.

<sup>61</sup> Brown, R. G. E., Jr. (1996, October 23). "Environmental science under siege: Fringe science and the 104th Congress, U. S. House of Representatives" (PDF). *Report, Democratic Caucus of the Committee on Science*. Washington, D. C.: U. S. House of Representatives.

<sup>62</sup> Conway, Erik; Oreskes, Naomi (2010). *Merchants of Doubt: How a Handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Global Warming*. USA: Bloomsbury.

<sup>63</sup> Dunlap, Riley E; McCright, Aaron M. (2011). *Climate Change Denial: Sources, actors, and strategies*. Taylor & Francis.

<sup>64</sup> Björnberg, Karin Edvardsson; et al. (2017). "Climate and environmental science denial: A review of the scientific literature published in 1990-2015". *Journal of Cleaner Production*. 167: 229–241.

<sup>65</sup> Some authors note that climate science—or the environmental sciences more generally—are prototypical “post-normal sciences”—“one where facts are uncertain, values in dispute, stakes high and decisions urgent ... we would be misled if we retained the image of a process where true scientific facts simply determine the correct policy conclusions.” See: Funtowicz, S. O., & Ravetz, J. R. (1995). Science for the post normal age. In *Perspectives on ecological integrity* (pp. 146-161). Springer, Dordrecht.

<sup>66</sup> Paglia, E. (2018). The Socio-scientific Construction of Global Climate Crisis, *Geopolitics*, 23:1, 96-123.

<sup>67</sup> By which we generally mean emissions mitigation and adaptation paths compatible with the “stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system,” which recent UNFCCC agreements have generally interpreted as mean global warming of no more than 1.5–2° C. An alternate perspective is optimality as determined by integrated assessment modeling (see, for example, Nordhaus, W. D. (1992). An optimal transition path for controlling greenhouse gases. *Science*, 258(5086), 1315-1319.). Other perspectives exist, too, but nearly all optimal control scenarios suggest mitigation far greater than currently observed levels.

and socially.<sup>68 69</sup> Others emphasize the challenge of overcoming barriers to cooperation in what amounts to a global prisoner's dilemma.<sup>70</sup> Our focus throughout is on the sort of psychological barriers to climate action summarized by Robert Gifford:<sup>71</sup> "Although many individuals are engaged in some ameliorative action, most ... are hindered by seven categories of psychological barriers ... limited cognition about the problem, ideological worldviews that tend to preclude pro-environmental attitudes and behavior, comparisons with key other people, sunk costs and behavioral momentum, discredence toward experts and authorities, perceived risks of change, and positive but inadequate behavior change." Notably, a number of these barriers relate to individuals' perceptions of the time horizon that might be implicated by "optimal action"; we suggest that the "crisification" of climate change is frequently an intentional attempt to increase the urgency of climate change in order to overcome these psychological barriers and, ultimately, to promote action.

This second process—the "making urgent" of ideational climate change—similarly relies on relays across circuits of meaning linking contributory and interactional experts.<sup>72</sup> Authors working in the securitization tradition of the Copenhagen School have sought to problematize these circuits of meaning—to highlight the intent embedded in discursive practices of what Buzan et al. call "speaking security"<sup>73</sup>—a critical perspective that motivates this paper. The Copenhagen School redefines "security" as a performative speech act: "by uttering 'security', a state-representative moves a particular development into a specific area, and thereby claims a special right to use whatever means are necessary to block it."<sup>74</sup> This speech act has two parts: first, speech that frames an issue in a way that justifies the (potentially unusual) remedies proposed for it; second, a relevant audience that accepts this frame. As Copenhagen School scholars study "security," we similarly explore "crisis" and "emergency," asking, as they do, what slippages might be elided in the translations of interactional experts.

Here, we argue that the "crisification" of climate change glosses over important psychological distinctions between contributory experts' claims of "increasing urgency" and the much broader constellation of meaning implicitly summoned by the crisis/emergency narration of interactional experts. In other words, the successful construal of climate "crisis" by interactional experts

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<sup>68</sup> Leiserowitz, A. (2007). Communicating the risks of global warming: American risk perceptions, affective images, and interpretive communities. In S. C. Moser, & L. Dilling (Eds.), *Creating a climate for change: Communicating climate change and facilitating social change* (pp. 44–63). Cambridge: Cambridge University Press.

<sup>69</sup> McDonald, R. I., Chai, H. Y., & Newell, B. R. (2015). Personal experience and the 'psychological distance' of climate change: An integrative review. *Journal of Environmental Psychology, 44*, 109–118.

<sup>70</sup> Barrett, S. (1999). International Cooperation and the Global Environment. *Global public goods*, 192.

<sup>71</sup> Gifford, R. (2011). The dragons of inaction: psychological barriers that limit climate change mitigation and adaptation. *American psychologist, 66*(4), 290.

<sup>72</sup> Paglia, 2018.

<sup>73</sup> Buzan, B., Wæver, O., Wæver, O., & De Wilde, J. (1998). *Security: A new framework for analysis*. Lynne Rienner Publishers.

<sup>74</sup> Wæver, O. (1995). "Securitization and Desecuritization." In: Lipschutz, Ronnie D. (Ed.): *On Security*. Columbia University Press. pp. 46–86.

enhances listeners' feelings of "urgency" (or time pressure), but so too may elicit related (and potentially undesirable) psychological responses such as fear, grief, and a greater discounting of future costs and benefits. In the context of the categories presented by Table 1, we might consider these psychological mechanisms as mediating a preference for mechanical or rational response—or, by extension, activating modes of meaning-making and decision characterized by either ideology or narrative, respectively. After below providing evidence for the processes and channels through which climate is framed as a "crisis," we review the potential psychological implications of the various mental states elicited by the crisis frame, albeit with a central core focus on the impacts of increased time pressure (as this is, we argue, the core, intended affective change).

#### ***4. Trends in climate discourse***

As awareness of the challenge of climate change has grown, so too has its discussion across many domains of communication. For example, the percent of all annual popular press articles<sup>75</sup> that mention a climate change term<sup>76</sup> has grown from 0.14 percent in 1999 to 1.62 percent in 2019 (Figure 1). Over the same time period, the use of the same terms in the academic press<sup>77</sup> grew from 0.26 to 1.05 percent of all published articles in the same respective years (Figure 1). Still, however, these secular trends belie simultaneously large discursive shifts in the language used to discuss climate change. As has been noted elsewhere, for example, the term "climate change" has largely displaced the term "global warming": every year until 2003, the term "global warming" dominated "climate change" in the popular press, but "climate change" now outnumbers mentions of "global warming" in the media almost six-to-one. (Figure 2)

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<sup>75</sup> Specifically, those indexed by Dow Jones Factiva

<sup>76</sup> Here defined as either "global warming," "climate change," "climate crisis," or "climate emergency."

<sup>77</sup> Specifically, those indexed by Scopus

Figure 1: Prevalence of all climate change terms by article type



Data: Scopus & Dow Jones Factiva

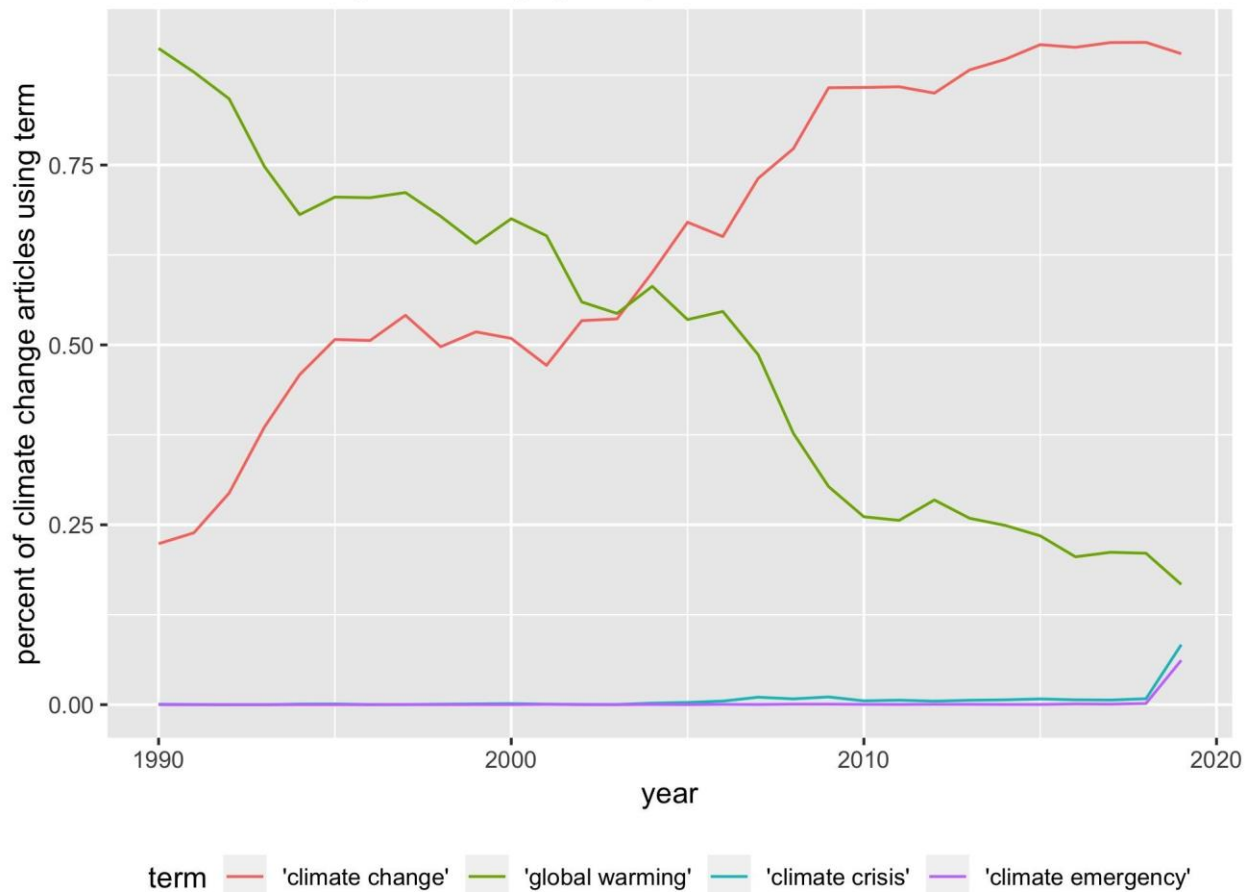
The rightmost portion of Figure 2 provides suggestive evidence for another significant shift currently underway: a proliferation of explicitly political, evaluative, or normative terms like “climate crisis” or “climate emergency” or the attachment of evaluative descriptors—in particular, “urgent” or “urgency”—to climate change language. Below, we present the results of a bibliometric analysis of the contours of this shift, analyzing the relative prevalence of different forms of time pressure language across four domains (the academic press, the popular press, documents of the international climate policy regime, and social movements) from the 1970s—when climate change was first discussed in these domains—to the present. We find that the overall shift toward time pressure framing is observed to be accelerating across all domains of our analysis, though different speech domains appear to prefer different terms, with the potential implication that “urgency” has come to function as a bridging concept<sup>78</sup> through which analytical

<sup>78</sup> Star, S. L., & Griesemer, J. R. (1989). Institutional ecology, translations' and boundary objects: Amateurs and professionals in Berkeley's Museum of Vertebrate Zoology, 1907-39. *Social Studies of Science*, 19(3), 387-420.

claims of time pressure by academics and policymakers are translated into a crisis or emergency frame by the popular press and political activists.

We note the suddenness of this shift: while “climate crisis” and “climate emergency” appeared in less than one percent of all periodical articles discussing climate change every year prior to 2019, the terms appeared in more than eight and six percent, respectively, of these articles this year (Figure 5). Indeed, “climate emergency” is Oxford Dictionaries 2019 “word of the year”<sup>79</sup>—itself chosen from a shortlist including both “climate crisis”<sup>80</sup> and “climate action.”

Figure 2: Relative prevalence of each climate change term across all climate change-related popular press articles



Data: Dow Jones Factiva

Articles appearing in academic journals, which are typically less likely to contain evaluative language, demonstrate a similar, albeit earlier, change: every year before 2007, time pressure

<sup>79</sup> A term that it subsequently defined as “a situation in which urgent action is required to reduce or halt climate change and avoid potentially irreversible environmental damage resulting from it.”

<sup>80</sup> The Collins Dictionaries’ “word of the year.”

terms are found together with discussions of climate change in less than 0.0005 percent of all academic articles, whereas in 2018, 0.014 percent of academic articles contained such co-occurrences—a 30-fold increase. Roughly half of this growth occurred in each of two periods, the first from 2006 to 2008 and the second from 2017 to 2019. While it is difficult to discern the precise reasons for the sudden proliferation of these discursive formations, there are obvious candidate catalysts.

*In the period 2006–2008:* Al Gore released his movie *An Inconvenient Truth* on 24 May 2006 and was awarded the Nobel Peace Prize jointly with the IPCC on 12 October 2007. The term “climate crisis” appeared both in Gore’s acceptance speech (10 December 2007) and in the film, which was released on video on 21 November 2006. The importance of this film to the popular imagination is suggested by Google Search trends for related terms (Figure 4). Later in this period, it was widely recognized that the world had failed to negotiate a comprehensive greenhouse gas emissions mitigation treaty at the 15th Conference of Parties of the UNFCCC, held in Copenhagen in December 2009, despite a prevailing sense that these negotiations would succeed (Figure 3).

*In the period 2017–2019:* Numerous social movements began to prominently use terms such as “climate emergency”; some, such as The Climate Mobilization, Extinction Rebellion, and Fridays for Future, have made the promotion of this discursive shift a key part of their organizational goals.<sup>81</sup> <sup>82</sup> Partly in response to these social movements, over 1300 local governments, 25 national governments, and the European Parliament have formally declared a “climate emergency” since January 2018.<sup>83</sup> Widespread strikes and protests (the “Global Climate Strike”) then took place 20–27 September 2019, a week which included the highly anticipated United Nations Climate Summit; organizers estimate up to 8 million people across 150 countries participated in this action. Google Search trend results for “climate crisis” and “climate emergency” illustrate the importance of these strikes for the salience of these terms (Figure 3).

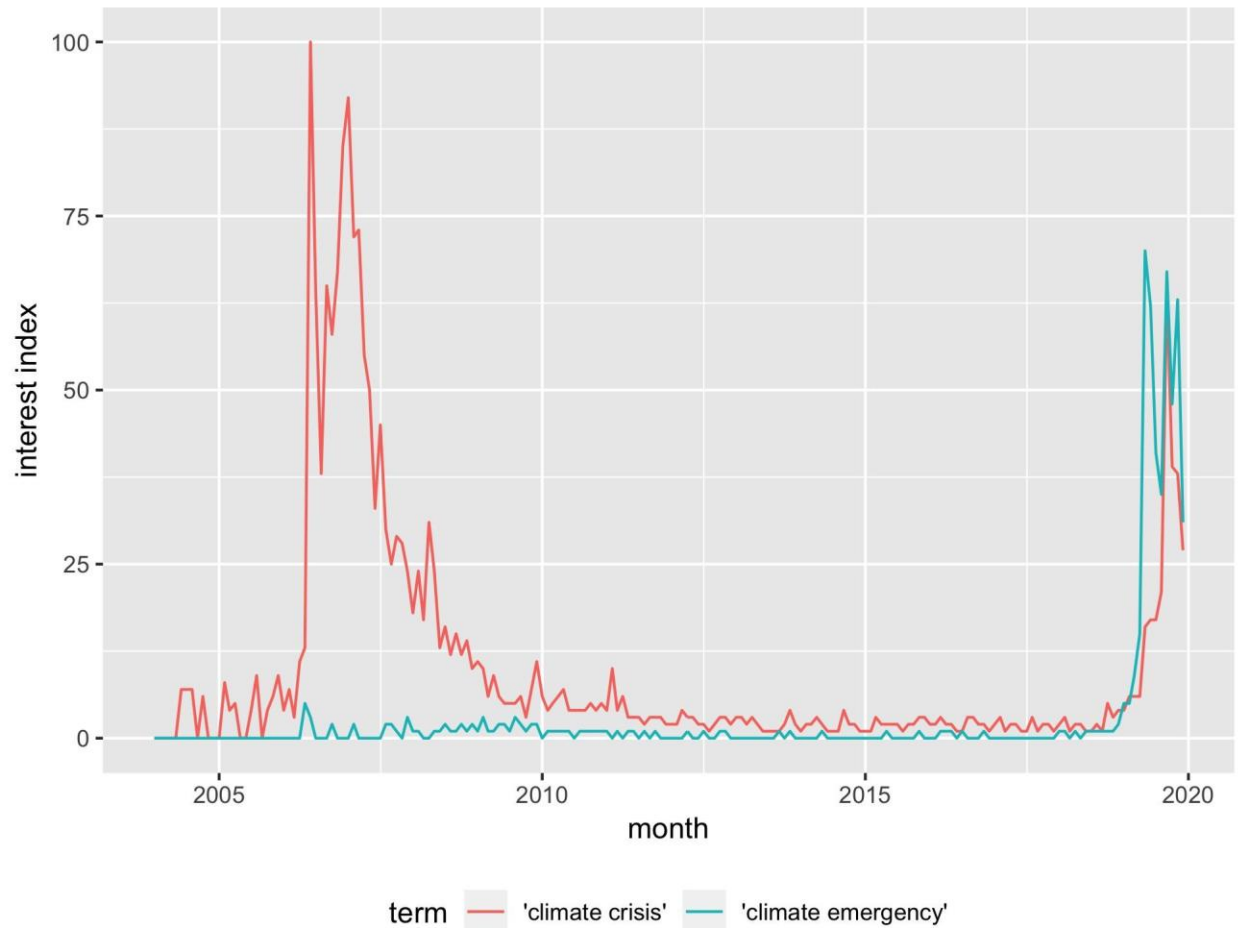
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<sup>81</sup> Consider The Climate Mobilization’s advocacy for local government declarations of “climate emergency”: “The goal of the Climate Emergency Campaign is to compel governments, starting at the local level and building upward, to adopt an emergency response to climate change and the broader ecological crisis. Entering emergency mode is the critical first step to launching the comprehensive mobilization required to rescue and rebuild civilization.”

<sup>82</sup> Note that some political movements began calling for such a linguistic shift much earlier—such as the Climate Crisis Coalition, founded in 2004, which stated as its goal “to create awareness and a sense of urgency about climate disruption and to broaden the constituency of the climate action movement.”

<sup>83</sup> Legislation for such a declaration at the national level in the United States was introduced to Congress on 9 July 2019 and is pending.

Figure 3: Google Trends (global) for climate time pressure terms



Data: Google Trends

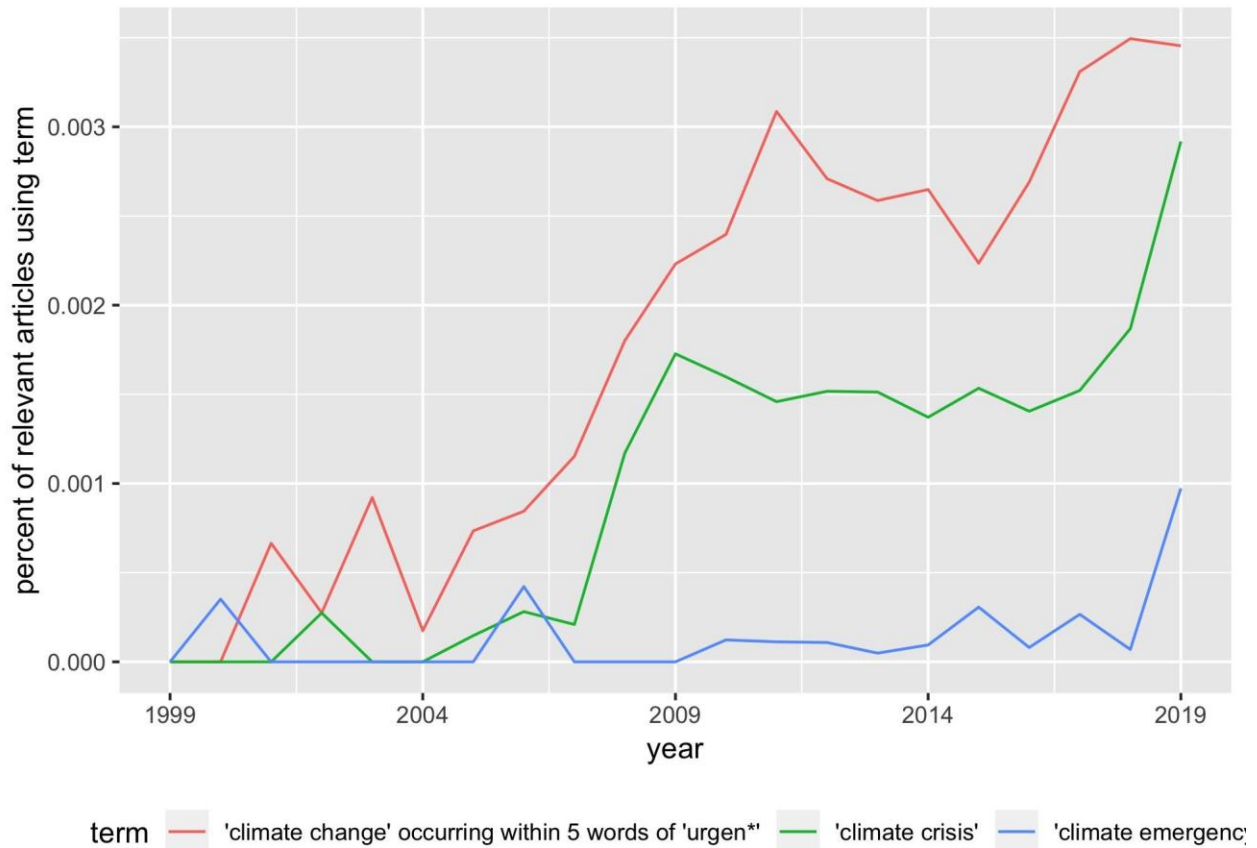
As a whole, articles from the academic press are more likely to use “urgency” language than “crisis” or “emergency” to describe climate change (Figure 4). There are a number of potential reasons for this apparent preference: first, “urgency” is at least facially more neutral and less alarmist<sup>84</sup>—perhaps a reflection of “scientific reticence”<sup>85</sup> or “erring on the side of least drama”;<sup>86</sup> second, “urgency” maps more cleanly onto existing language (“climate change” and “global warming”) that is deeply embedded in a publishing ecosystem heavily reliant on the persistence of keywords and journal titles.

<sup>84</sup> The academic community as a whole, however, uses the terms “crisis” and “emergency” more often than “urgency” or “urgent,” which suggests that the reluctance to use these facially more political terms is not generalized (See Appendix A).

<sup>85</sup> Hansen, J. E. (2007). Scientific reticence and sea level rise. *Environmental research letters*, 2(2), 024002.

<sup>86</sup> Brysse, K., Oreskes, N., O’Reilly, J., & Oppenheimer, M. (2013). Climate change prediction: Erring on the side of least drama?. *Global environmental change*, 23(1), 327-337.

Figure 4: Prevalence of different climate time pressure terms in academic articles relative to the total volume of climate change-related academic articles



Data: Scopus; see methodological note in Appendix C

The overall prevalence of time pressure terms in popular press discussions of climate change appears to largely mirror that seen in the academic literature (Figure 5; note differing axes), with the exception of 2019, a year during which the terms “climate crisis” and “climate emergency” grew markedly in use (Figure 5). Much of this growth in the prevalence of these terms in the popular press was driven by a number of major media outlets, notably *The Guardian*<sup>87</sup> and Telemundo,<sup>88</sup> that changed their style guides to mandate the use of either “climate crisis” or “climate emergency” in place of “climate change” or “global warming”—a move which followed earlier suggestions by activists and politicians to that effect.<sup>89</sup>

<sup>87</sup>Carrington, D. (2019, May 17). “Why the Guardian is changing the language it uses about the environment.” *The Guardian*.

<sup>88</sup> *Planeta Tierra: Alzar la voz contra la Emergencia Climática | Noticias Telemundo*. (2019, June 5). Noticias Telemundo.

<sup>89</sup> An often cited example is Greta Thunberg’s 4 May 2019 tweet: “It’s 2019. Can we all now please stop saying “climate change” and instead call it what it is: climate breakdown, climate crisis, climate emergency, ecological breakdown, ecological crisis and ecological emergency? #ClimateBreakdown #EcologicalBreakdown.”



Shortly after *The Guardian*'s style guide modifications, two prominent announcements were made related to climate journalism. First, Public Citizen—in collaboration with the Sierra Club, Food & Water Watch, Greenpeace USA, 350.org, and a number of other prominent advocacy organizations—relayed an open letter<sup>90</sup> to the presidents and CEOs of ABC, CBS, Fox, NBC, MSNBC, and CNN that called on them to make similar changes to their networks' coverage of climate change. Second, the *Columbia Journalism Review* and *The Nation* published an open letter calling for better journalistic coverage of climate change (“Instead of sleepwalking us toward disaster,” it reads, “the US news media need to remember their Paul Revere responsibilities—to awaken, inform, and rouse the people to action”<sup>91</sup>) and established a joint project, Covering Climate Now, that asked networks to commit to making “a good faith effort to run as much high-quality climate coverage” as possible for the week before the United Nations' Climate Action Summit in New York on 23 September 2019. Around 200 outlets—including Bloomberg, CBS News, El País, the *Asahi Shimbun*, *The Times of India*, *Nature*, *Science*, the *Harvard Business Review*, *Vanity Fair*, HuffPost, BuzzFeed News, and The Daily Beast—agreed to participate.

While a small number outlets made changes as explicit as that made by *The Guardian*,<sup>92</sup> many increased their coverage of climate change (Figure 1); the frequency with which coverage of climate change included time pressure terms, however, grew much faster than coverage of climate change as a whole (Figure 5 reports frequency relative to the underlying volume of climate change coverage).<sup>93</sup> Notably, though, the use of “urgency” language has experienced far slower recent growth in the popular press than the use of “crisis” or “emergency” language.

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<https://twitter.com/GretaThunberg/status/1124723891123961856>>. Earlier, the United States House of Representatives had in January 2019 established a “Select Committee on the Climate Crisis” and the Secretary General of the United Nations, António Guterres, had talked of the “climate crisis” in a widely covered September 2018 speech.

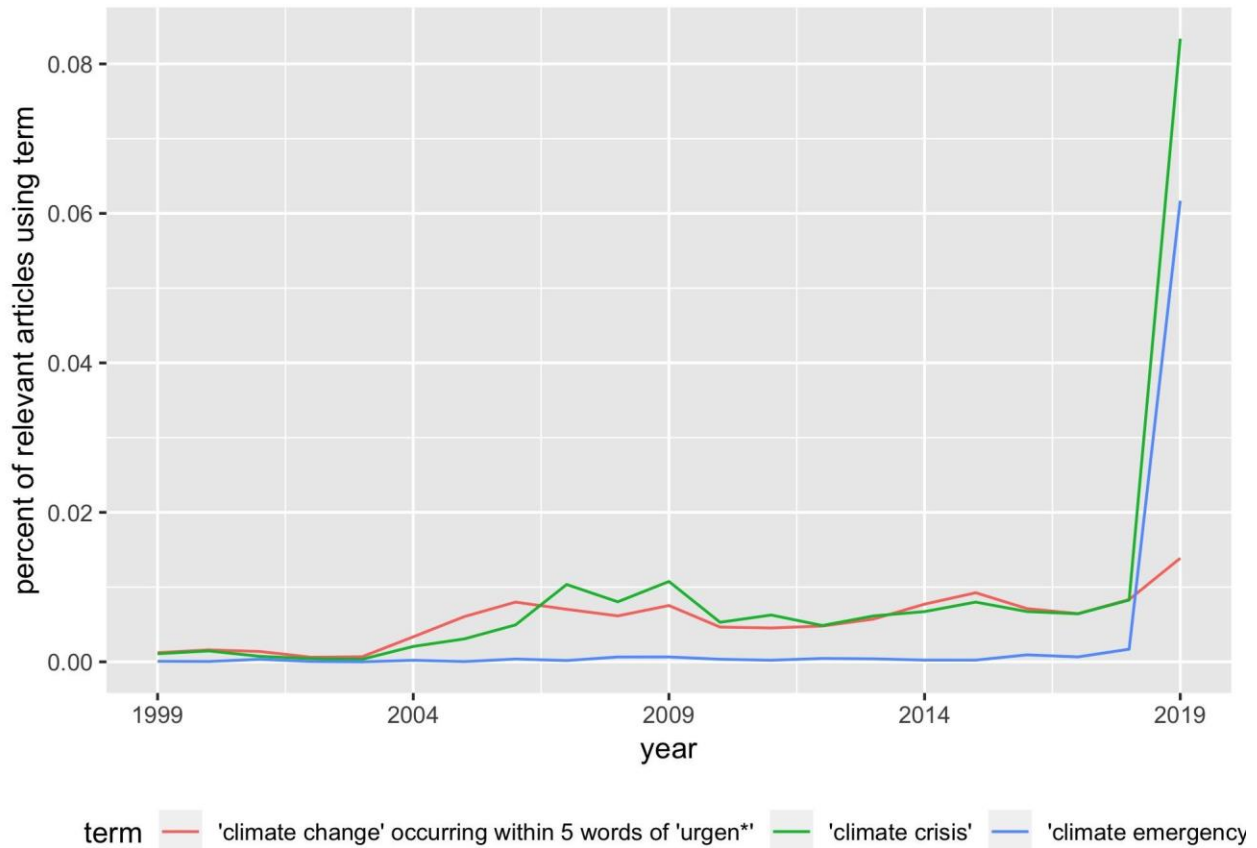
<sup>90</sup> Weissman, R., Brune, M., Hauter, W., Leonard, A., McKibben, B., Miller, R. L., Minsky, A., Berlin, K., Pica, E., Prakash, V., Romero, M., Suckling, K., & Yearwood, Rev. (2019, June 6). *Letter to Major Networks: Call it a Climate Crisis - and Cover it Like One*. Public Citizen.

<sup>91</sup> Hertsgaard, M. and Pope, K. (2019, April) “The media are complacent while the world burns.” *Columbia Journalism Review*.

<sup>92</sup> The Canadian Broadcasting Corporation, for instance, updated its style guide to say the following: “Climate crisis and climate emergency are OK in some cases as synonyms for “climate change.” But they're not always the best choice... For example, “climate crisis” could carry a whiff of advocacy in certain political coverage.”

<sup>93</sup> CNN is notable for holding a “Climate Crisis Town Hall” featuring 10 Democratic candidates for U.S. President.

Figure 5: Prevalence of different climate time pressure terms in popular press articles relative to the total volume of climate change-related popular press articles



Data: Dow Jones Factiva; see methodological note in Appendix C

In comparison, we find that academic and popular press articles differ in the time pressure terms they use to describe climate change despite discussing climate change at similar overall rates. One potential implication of this observation is that “urgency”—as distinct from “crisis” or “emergency”—has come to function as a bridging concept that relays the notion of time pressure between the research community and the media. Indeed, justifications for the use of “crisis” or “emergency” frames—for example, pieces explaining *The Guardian*’s style changes,<sup>94</sup> bolstering The Climate Mobilization’s advocacy for climate emergency declarations,<sup>95</sup> or justifying

<sup>94</sup> Zeldin-O’Neill, S. (2019, October 16). “It’s a crisis, not a change”: The six Guardian language changes on climate matters. *The Guardian*.

<sup>95</sup> Climate Mobilization Project. (n.d.). What is the Climate Emergency? Google Docs. Retrieved May 1, 2020, from [https://docs.google.com/document/d/1iTD3jby1GLId4Oudm9UpzY-cXUWCR5oH58Hr\\_LBLagA/edit?usp=embed\\_facebook](https://docs.google.com/document/d/1iTD3jby1GLId4Oudm9UpzY-cXUWCR5oH58Hr_LBLagA/edit?usp=embed_facebook)

Extinction Rebellion’s “climate crisis” frame<sup>96</sup>—often cite recent international documents<sup>97</sup> that use almost exclusively “urgent” to describe the time pressure associated with climate change (Appendix B). In other words, these institutions equate researchers’ statements of “urgency” with “crisis” or “emergency” despite their different semantic content.

This observed difference might be explained, at least in part, by domain norms. Boykoff and Rajan, for instance, write that “some of the challenges of reporting on climate change are inherent to the differences in language—in both lexicon and usage—between science and the public. Scientists tend to speak in cautious language when describing their research, and to discuss the implications of their research in terms of probabilities. For journalists and policy-makers, this is difficult to translate into the crisp, unequivocal commentary that is often valued in communications and decision-making.”<sup>98</sup> The translation of climate change research for public consumption is notoriously difficult given its reliance on time-varying probability distributions that result from the projection of historical data into previously unobserved states of the earth system.

The result of this translation is interactional experts’ articulation of a “crisis”/“emergency” frame. The success of this articulation (and its attendant political and psychological salience) relies, though, on constructing an equivalence with contributory experts’ claims of urgency—something we find are of relatively recent origin (Figure 4; Appendix B). Unsuccessful

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<sup>96</sup> Extinction Rebellion. (n.d.). The Emergency. Extinction Rebellion. Retrieved May 1, 2020, from <https://rebellion.earth/the-truth/the-emergency/>

<sup>97</sup> These explanations tend especially to cite the 2018 IPCC special report “Global Warming of 1.5 °C,” the UNFCCC’s 2015 Paris Agreement, the language of Sustainable Development Goal 13, and the 2019 Global Assessment Report on Biodiversity and Ecosystem Services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. Of interest, the summary statement of SDG 13 (“Take urgent action to combat climate change and its impacts”) is perhaps the most prominent—and a relatively early—description of climate change as an “urgent” issue. The “urgency” language in this goal was to have been settled in July 2014 after it was introduced as an alternative to the more neutral “combat climate change” and “tackle climate change” by representatives of the Alliance of Small Island States (ASIS) and the Small Island Developing States (SIDS) at the Thirteenth Session of the Open Working Group of the UN General Assembly on Sustainable Development Goals (<https://enb.iisd.org/download/pdf/enb3213e.pdf>); the motivation behind this linguistic change was clarified at an OWG13 side event (“A Global Call Spanning the Polar Regions to the Tropics: Sustainable Development Goals Must Prioritize Climate Change,” organized by the United Nations Non-Governmental Liaison Service and co-hosted by the Permanent Missions of Peru and the Solomon Islands to the UN, Greenpeace, 350.org, the International Alliance of Indigenous and Tribal Peoples of Tropical Forests, Climate Action Network International, Beyond 2015, Global Call for Climate Action, and the Natural Resources Defense Council) and is evident in the text of the Small Island Developing States Accelerated Modalities of Action Pathway negotiated by ASIS and SIDS and adopted later the same year, providing support for the final language approved for SDG 13 in September 2015—which itself influenced the final text of the Paris Agreement.

<sup>98</sup> Boykoff, M. T., & Rajan, S. R. (2007). Signals and noise. *EMBO Reports*, 8(3), 207–211.

articulation of a crisis frame may lead to permanent damage to the authority of the frame narrator<sup>99</sup> and eventual “policy boomerangs.”<sup>100 101</sup>

Further, this articulation, even if successful, does not necessarily ensure greater, more optimal, or faster action. As noted elsewhere, crises may be “focusing events,” presenting policy windows by changing the relative positions of items in a policy agenda<sup>102 103</sup> or creating an opening for policy entrepreneurs<sup>104 105</sup> with “solutions in search of a problem.”<sup>106</sup> At the same time, however, crises may generate counterproductive responses, including the development of a fatalistic outlook—leading to an abandonment of mitigation as a viable strategy<sup>107</sup>—or wholesale skepticism of experts.<sup>108 109</sup>

Framing environmental issues—and especially climate change—as crises may be particularly challenging<sup>110 111</sup> for two reasons: first, these problems often lack clearly constructable “enemies”<sup>112</sup>—indeed, evidence for them is often invisible outside of technical, statistical residues;<sup>113</sup> second, potential solutions to these problems are themselves uncertain, leading to a sense of threat in the absence of agency through which to address it—“insecuritizing” message recipients.<sup>114</sup> Ultimately, the responses generated by the crisis framing of climate change, then,

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<sup>99</sup> Boas, I. (2015). *Climate Migration and Security: Securitization as a Strategy in Climate Change Politics*. New York: Routledge.

<sup>100</sup> Paletz, D. L., Koon, J., Whitehead, E., & Hagens, R. B. (1972). Selective exposure: The potential boomerang effect. *Journal of Communication*, 22(1), 48-53.

<sup>101</sup> Swatuk, L. A., Wirkus, L., Krampe, F., Thomas, B. K., & da Silva, L. P. B. (2018). The boomerang effect: Overview and implications for climate governance. In *Water, Climate Change and the Boomerang Effect*. Routledge.

<sup>102</sup> Birkland T. (2009). Media framing and policy change after Columbine. *American Behavioral Scientist* 52: 1405–1425.

<sup>103</sup> Lowry W. (2006). Potential focusing events and policy change. *Policy Studies Journal* 34: 313–335.

<sup>104</sup> Carter, N. and Childs, M. (2017). Friends of the Earth as a policy entrepreneur: The ‘Big Ask’ campaign for a UK Climate Change Act. *Environmental Politics* 27: 994–1013.

<sup>105</sup> Warner, J.F., Lulofs, K., and Bressers, H. (2010). The fine art of boundary spanning: making space for water in the East Netherlands. *Water Alternatives* 3(1): 137–153.

<sup>106</sup> Kingdon, J. (1990). *Agendas, alternatives, and public policies*. New York: Harper Collins.

<sup>107</sup> Methmann, C. and Rothe, D. (2012). Politics for the day after tomorrow: The political effect of apocalyptic imageries in global climate governance. *Security Dialogue* 43(4): 323–344.

<sup>108</sup> Lowe, T., Brown, K., Dessai, S., et al. (2006). Does tomorrow ever come? Disaster narrative and public perceptions of climate change. *Public Understanding of Science* 15: 435–457.

<sup>109</sup> O’Neil, S., and Nicholson-Cole, S. (2009). ‘Fear won’t do it’. Promoting positive engagement with climate change through visual and iconic representations. *Science Communications* 30(3): 355–379.

<sup>110</sup> Buzan, B., Waeber, O., and de Wilde, J. (1998). *Security: A New Framework*. Harvester Wheatsheaf.

<sup>111</sup> Trombetta, M.J. (2008). Environmental security and climate change: Analysing the discourse. *Cambridge Review of International Affairs*. 21(4): 585–602.

<sup>112</sup> Prins, G. (1993). *Threats without Enemies: Facing Environmental Security*. London: Earthscan.

<sup>113</sup> Hamblyn, R. (2009). *The whistleblower and the canary: Rhetorical reconstructions of climate change*. *Journal of Historical Geography* 35: 223–236.

<sup>114</sup> Bigo, D. (2002). Security and immigration: Toward a critique of the governmentality of unease. *Alternatives: Global, Local, Political*. 27: 63–92.

depend on both message content and characteristics of the listener. Below, we conclude by briefly reviewing the evidence for the various psychological mechanisms mediating these responses.

### ***5. The psychological implications of time pressure framing for decision making***

Research on the effects of time pressure framing on decision making spans disciplinary boundaries, and addresses different time scales and domains of action. However, direct explorations of the effect of this framing on climate decisions is scarce, likely owing to the pace and complexity of the relationship between framing and the mitigation and adaptation choices collectively pursued by individuals, organizations, and governments. We begin by developing a conceptual model of an individual's framing–psychology–choice process (Figure 6). This model depicts relays within and across conceptual categories, but broadly comprises two halves:

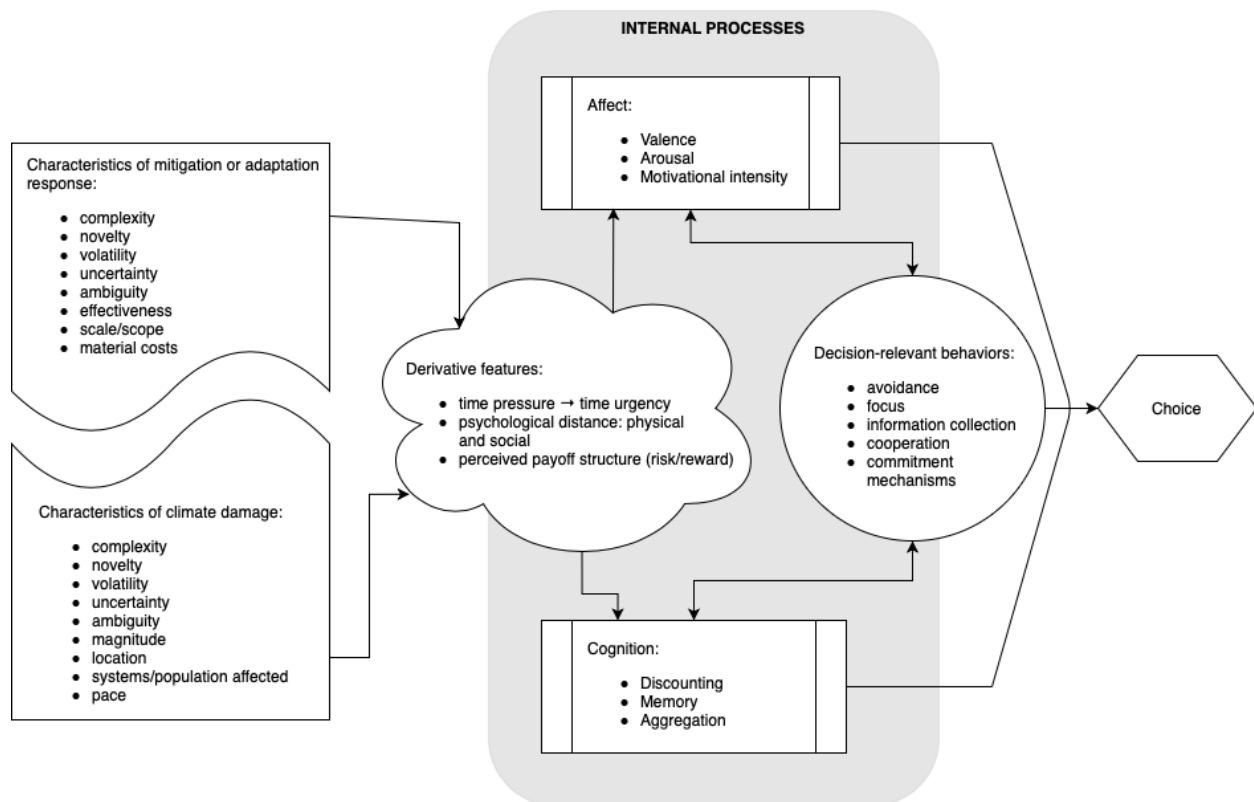
- *The internalization of time pressure framing and resulting changes to affect and cognition* (centered on the left side of Figure 6): Climate change frames encode various types of information. For instance, a particular framing of climate change may change the relative salience of the potential scale and scope of various impacts; another, especially one that frames climate change as an “emergency,” might enhance the relative salience of information about impact pacing and sequencing. Evidence shows that information has psychological effects, though these effects are contextual (that is, they are determined in interaction with related information, the environment, etc.) and particular (i.e., it is affected by listener characteristics, including their memories, baseline emotional state, and social status). As information about climate change, framed in a particular way, is internalized, it combines into more complex derivative features, such as psychological distance, perceived risks and rewards of different responses and impacts, and time pressure. This information and its derivative features elicit affective or emotional states<sup>115</sup> (including fear, grief, anger, hope, apathy, or guilt) and changes to cognition (including one's time discount rate, approach to risk and uncertainty, or social aggregation weights), which are typically modeled separately.<sup>116</sup>
- *The externalization of affect and cognition in choice* (roughly the right side of Figure 6): The ways in which a frame modulates an individual's affective or cognitive processes in turn affect the quantity and quality of information considered in the choice process, as well as the range of response options they consider (for example, geoengineering) and the

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<sup>115</sup> Loewenstein, G. F., Weber, E. U., Hsee, C. K., & Welch, N. (2001). Risk as feelings. *Psychological Bulletin*, 127(2), 267.

<sup>116</sup> Zajonc, R. B. (1980). Feeling and thinking: Preferences need no inferences. *American Psychologist*, 35(2), 151.

sequencing and timing of chosen plan elements. An individual’s mental states also affect choice indirectly by leading to the adoption of various decision-relevant behaviors, such as greater focus, information collection, cooperation, active avoidance, or the adoption of a commitment mechanism. The realized effects of these mental states on choice exhibit heterogeneity by characteristics of the individuals in which they manifest.



Though calls for more research into these processes have persisted for over a decade,<sup>117 118</sup> our understanding has been hindered by the fact that researchers generally only observe the outcomes of the complex system represented in Figure 6. Adding to this complexity, any work in this field must also grapple with the multiple meanings associated with climate change; co-occurring social, technological, and ecological changes; and mediators and moderators of the impacts of climate change.<sup>119</sup> Still, available insight<sup>120</sup> and practitioner interest continues to

<sup>117</sup> Kazdin, A.E. (2009). Psychological science’s contributions to a sustainable environment: Extending our research to a grand challenge of society. *American Psychologist*, 64, 339–356.

<sup>118</sup> Nordhaus, T., & Shellenberger, M. (2007). *Break through: From the death of environmentalism to the politics of possibility*. New York, NY: Houghton Mifflin.

<sup>119</sup> Doherty, T. J., & Clayton, S. (2011). The psychological impacts of global climate change. *American Psychologist*, 66(4), 265.

<sup>120</sup> Swim, J., Clayton, S., Doherty, T., Gifford, R., Howard, G., Reser, J., et al. (2009). *Psychology and global climate change: Addressing a multi-faceted phenomenon and set of challenges*. Washington, DC: American Psychological Association.

grow—much relevant to our narrower focus here: the effect of time pressure framing on climate-relevant decisions.

### 5.1. *Affective processes*

At its most basic level, simply thinking about climate change—whether as a crisis or not—generates a variety of emotional states. The most recent edition of “Climate Change in the American Mind,”<sup>121</sup> a semi-annual survey, found that Americans report feeling either moderate or intense versions of the following emotions when thinking about climate change, in decreasing prevalence: worry (66 percent), interest, helplessness, disgust, fear, rage, anger, hope, shame, guilt, and courage (29 percent). Further, the percent of Americans “very worried” about climate change has tripled since 2010, while the percent of Americans feeling any degree of hope has remained unchanged. A 2017 special report from the American Psychological Association, “Mental Health and Our Changing Climate,” states that “psychological responses to climate change, such as conflict avoidance, fatalism, fear, helplessness, and resignation are growing. These responses are keeping us, and our nation, from properly addressing the core causes of and solutions for our changing climate, and from building and supporting psychological resiliency.”<sup>122</sup>

Fear is perhaps the best understood potential emotional consequence of climate crisis framing. Theoretical interest in the effects of fear appeals on affect and choice date to the early 1970s.<sup>123</sup> Extensive laboratory studies on fear appeals have led to the development of many (at times conflicting) models relating fear to action, including the linear, nonlinear, parallel processing,<sup>124</sup> expectancy value, and protection motivation models. The lack of clarity resulting from laboratory studies of fear appeals suggests that fear may have a weak and directionally ambiguous<sup>125</sup> effect on action in the context of larger, longer term decisions more closely resembling those relevant to climate change.<sup>126</sup> Still, some findings are consistent: fear appeals are likely to produce maladaptive responses such as defensive avoidance, selective exposure,

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<sup>121</sup> Leiserowitz, A., Maibach, E., Rosenthal, S., Kotcher, J., Bergquist, P., Ballew, M., Goldberg, M., & Gustafson, A. (2019). *Climate change in the American mind: November 2019*. Yale University and George Mason University. New Haven, CT: Yale Program on Climate Change Communication.

<sup>122</sup> Clayton, S., Manning, C. M., Krygsmann, K., & Speiser, M. (2017). *Mental Health and Our Changing Climate: Impacts, Implications, and Guidance*. Washington, D.C.: American Psychological Association, and ecoAmerica.

<sup>123</sup> Leventhal, H. (1971). Fear appeals and persuasion: the differentiation of a motivational construct. *American Journal of Public Health*, 61(6), 1208-1224.

<sup>124</sup> Witte, K. (1992). Putting the fear back into fear appeals: The extended parallel process model. *Communications Monographs*, 59(4), 329-349.

<sup>125</sup> Lowe, T., Brown, K., Dessai, S., de Franca Doria, M., Haynes, K., & Vincent, K. (2006). Does tomorrow ever come? Disaster narrative and public perceptions of climate change. *Public Understanding of Science*, 15, 435-457.

<sup>126</sup> Hastings, G., Stead, M., & Webb, J. (2004). Fear appeals in social marketing: Strategic and ethical reasons for concern. *Psychology & Marketing*, 21, 961-986.

apathy, and reactance<sup>127 128 129</sup> (some studies suggest fear appeals in isolation may become so overwhelming as to produce anger and violence<sup>130</sup>), but these maladaptive responses are tempered if the fear appeal is presented alongside equally salient information about self-efficacy.<sup>131 132</sup> In the better studied public health context of fear appeals, “perceived self-efficacy in responding to a threat, expected response costs, and intention have been found to be the strongest predictors of concurrent or future behavior.”<sup>133</sup> Put simply, fear is shown to provoke one of two responses: an attempt to control the source of fear or, if this is challenging or impossible, an attempt to directly control this affective state.<sup>134</sup> Important to our discussion here, some evidence suggests that the invocation of fear in more deliberative, longer-term decision making may also promote cooperation or compromise while an individual seeks to construct a sense of self-efficacy.<sup>135</sup>

An enhanced sense of crisis can also produce feelings of grief. In parsing the constellation of negative valence climate emotions, it can be helpful to distinguish between retrospective and prospective feelings.<sup>136</sup> Cunsolo and Ellis, for instance, document climate grief associated with already realized physical environmental loss and the loss of environmental knowledge—occasionally styled as “solastalgia”<sup>137</sup>—but also an anticipatory grief over expected future losses of culture, livelihoods, and ways of life.<sup>138</sup> Such grief manifests in groups as diverse as wheat farmers in Western Australia,<sup>139</sup> the Inuit in Arctic Canada,<sup>140</sup> and Sami reindeer herders in

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<sup>127</sup> Witte, K. (1994). Fear control and danger control: A test of the extended parallel process model (EPPM). *Communications Monographs*, 61(2), 113-134.

<sup>128</sup> Ruiter, R. A., Abraham, C., & Kok, G. (2001). Scary warnings and rational precautions: A review of the psychology of fear appeals. *Psychology and Health*, 16(6), 613-630.

<sup>129</sup> Ruiter, R. A., Verplanken, B., De Cremer, D., & Kok, G. (2004). Danger and fear control in response to fear appeals: The role of need for cognition. *Basic and Applied Social Psychology*, 26(1), 13-24.

<sup>130</sup> Gray, G. M., & Ropeik, D. P. (2002). Dealing with the dangers of fear: the role of risk communication. *Health Affairs*, 21(6), 106-116.

<sup>131</sup> Bandura, A. (1997). *Self-Efficacy: The Exercise of Control*. Macmillan.

<sup>132</sup> Ruiter, et al., 2001.

<sup>133</sup> Milne, S., Sheeran, P., & Orbell, S. (2000). Prediction and intervention in health-related behavior: A meta-analytic review of protection motivation theory. *Journal of Applied Social Psychology*, 30(1), 106-143.

<sup>134</sup> Moser, S. C., & Dilling, L. (2004). Making climate hot. *Environment*, 34, 32-46.

<sup>135</sup> MacKuen, M., Wolak, J., Keele, L., & Marcus, G. E. (2010). Civic engagements: Resolute partisanship or reflective deliberation. *American Journal of Political Science*, 54(2), 440-458.

<sup>136</sup> Robinson, M. D., & Clore, G. L. (2002). Belief and feeling: evidence for an accessibility model of emotional self-report. *Psychological Bulletin*, 128(6), 934.

<sup>137</sup> Albrecht, G., Sartore, G. M., Connor, L., Higginbotham, N., Freeman, S., Kelly, B., ... & Pollard, G. (2007). Solastalgia: the distress caused by environmental change. *Australasian Psychiatry*, 15(sup1), S95-S98.

<sup>138</sup> Cunsolo, A., & Ellis, N. R. (2018). Ecological grief as a mental health response to climate change-related loss. *Nature Climate Change*, 8(4), 275.

<sup>139</sup> Ellis, N. R., & Albrecht, G. A. (2017). Climate change threats to family farmers' sense of place and mental wellbeing: A case study from the Western Australian Wheatbelt. *Social Science & Medicine*, 175, 161-168.

<sup>140</sup> Cunsolo Willox, A., Harper, S. L., Ford, J. D., Landman, K., Houle, K., & Edge, V. L. (2012). “From this place and of this place.” Climate change, sense of place, and health in Nunatsiavut, Canada. *Social Science & Medicine*, 75(3), 538-547.



northern Sweden.<sup>141</sup> Feelings of anticipatory grief are likely to be “both acute and chronic, carried psychologically and emotionally, but ... not linked to any one event or break moment, and [to] develop[] over time, with knowledge of what could come based both on already-experienced changes ... and projected changes.”<sup>142</sup> Due to their future orientation, such feelings may be furthermore opaque—a sort of ambiguous loss<sup>143</sup> for which terminological resolution is particularly challenging. Important to action, climate grief contains but also reinforces a sense of low self-efficacy, a recognized feature of trauma.<sup>144</sup> Faced with a seemingly insurmountable challenge, individuals become less charitable (because they perceive their individual influence as small) and experience less “warm glow” when at least some suffering cannot be avoided.<sup>145</sup> Negative moods are also associated with deeper, more deliberative, and more critical processing of risk information and overtly persuasive narratives.<sup>146 147</sup>

Some authors, however, find that descriptions of or information about climate change fail to generate a sense of urgency when not explicitly framed as a matter of high time pressure because of the psychological distance that is created in the absence of this frame.<sup>148</sup> Supporting this claim, recent evidence suggests that the time pressure framing of climate change modulates affect in ways that neutral description or information do not; different climate change terms have been empirically shown to cause differing levels of physiological arousal: laboratory measurements of electroencephalography and galvanic skin response indicate that “climate change,” for instance, produces less than one-third the somatic response of “climate crisis” in self-identified Republicans (the effect is significantly smaller for self-identified Democrats).<sup>149</sup> The effect of increased affective stress on decision making depends on characteristics of both the decision maker and the decision situation. In a recent review of the effect of stress on decision making, Starcke and Brand find that greater stress leads to more automatic action, reduced learning, and higher reward sensitivity, but that there are “situations in which increased risk

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<sup>141</sup> Furberg, M., Evengård, B., & Nilsson, M. (2011). Facing the limit of resilience: perceptions of climate change among reindeer herding Sami in Sweden. *Global Health Action*, 4(1), 8417.

<sup>142</sup> Cunsolo & Ellis, 2018.

<sup>143</sup> Pauline, B., & Boss, P. (2009). *Ambiguous loss: Learning to live with unresolved grief*. Harvard University Press.

<sup>144</sup> Benight, C. C., & Bandura, A. (2004). Social cognitive theory of posttraumatic recovery: The role of perceived self-efficacy. *Behaviour Research and Therapy*, 42(10), 1129-1148.

<sup>145</sup> Västfjäll, D., Slovic, P., & Mayorga, M. (2015). Pseudoinefficacy: negative feelings from children who cannot be helped reduce warm glow for children who can be helped. *Frontiers in Psychology*, 6, 616.

<sup>146</sup> Finucane, M. L. (2008). Emotion, affect, and risk communication with older adults: challenges and opportunities. *Journal of Risk Research*, 11(8), 983-997.

<sup>147</sup> Schwarz, N., Bless, H., & Bohner, G. (1991). Mood and persuasion: Affective states influence the processing of persuasive communications. In: *Advances in experimental social psychology* (Vol. 24, pp. 161-199). Academic Press.

<sup>148</sup> Weber, E. U. (2006). Experience-based and description-based perceptions of long-term risk: why global warming does not scare us (yet). *Climatic Change*, 77(1-2), 103-120.

<sup>149</sup> Spark Neuro. (2019). Rebranding Climate Change. <https://sparkneuro.com/case-studies/rebranding-climate-change>

taking, heightened reward sensitivity and automatic processing may be beneficial.”<sup>150</sup> Climate-related stress, in particular, is also likely to lead to increases in stress-related problems, such as substance abuse, anxiety disorders, and depression.<sup>151</sup>

Related to our earlier discussion, emotion itself is a central reason why high levels of stress negatively affect choice quality.<sup>152</sup> Some research suggests that affect may be considered a kind of heuristic for judging the relative costs and benefits of potential actions.<sup>153</sup> <sup>154</sup> A closely related theory, the risk-as-feelings hypothesis,<sup>155</sup> argues that risk information, such as that contained in time pressure messaging, produces a visceral affective response (including fear, anger, guilt, anxiety, or dread) that in turn has informational value to cognitive deliberation.<sup>156</sup> While some studies have shown that individuals who perceive greater risks from climate change are more likely to have begun to address it,<sup>157</sup> causality in this relationship—given related research on stress and affect—is by no means clear.

Insofar as stress is related to increased time pressure, time constraints—perceived or actual—thus affect one’s ability to make good decisions; a large body of literature has found this to be the case for individuals,<sup>158</sup> groups,<sup>159</sup> organizations,<sup>160</sup> and political bodies.<sup>161</sup> In investigating differences in individuals’ responses to time constraints, psychologists distinguish between the related notions of time pressure and time urgency.<sup>162</sup> The former, time pressure, typically refers

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<sup>150</sup> Starcke, K., & Brand, M. (2012). Decision making under stress: a selective review. *Neuroscience & Biobehavioral Reviews*, 36(4), 1228-1248.

<sup>151</sup> Neria, Y., & Shultz, J. M. (2012). Mental health effects of Hurricane Sandy: Characteristics, potential aftermath, and response. *JAMA*, 308(24), 2571-2572.

<sup>152</sup> Phelps, E. A., Lempert, K. M., & Sokol-Hessner, P. (2014). Emotion and decision making: multiple modulatory neural circuits. *Annual Review of Neuroscience*, 37, 263-287.

<sup>153</sup> Slovic, P., Finucane, M. L., Peters, E., & MacGregor, D. G. (2002). The affect heuristic. In: T. Gilovich, D. Griffin, & D. Kahneman (Eds.), *Heuristics and biases: The psychology of intuitive judgment* (pp. 397–420). New York: Cambridge University Press.

<sup>154</sup> Finucane, M. L., Alhakami, A., Slovic, P., & Johnson, S. M. (2000). The affect heuristic in judgments of risks and benefits. *Journal of Behavioral Decision Making*, 13(1), 1-17.

<sup>155</sup> Loewenstein, G. F., Weber, E. U., Hsee, C. K., & Welch, N. (2001). Risk as feelings. *Psychological Bulletin*, 127, 267–286.

<sup>156</sup> Schwarz, N., & Clore, G.L. (1996). Feelings and phenomenal experiences. In: E. T. Higgins & A. Kruglanski (Eds.), *Social psychology: Handbook of basic principles* (pp. 433–465). New York: Guilford.

<sup>157</sup> Syal, S. S., Wilson, R. S., Mac Crawford, J., & Lutz, J. (2011). Climate change and human health—what influences the adoption of adaptation programming in the United States public health system?. *Mitigation and Adaptation Strategies for Global Change*, 16(8), 911-924.

<sup>158</sup> Steel, P., & König, C. J. (2006). Integrating theories of motivation. *Academy of Management Review*, 31(4), 889-913.

<sup>159</sup> Janis, I. L. (1989). *Crucial decisions: Leadership in policymaking and crisis management*. Simon and Schuster.

<sup>160</sup> Bronner, R. (1982). *Decision making under time pressure: an experimental study of stress behavior in business management*. Lexington, MA: Lexington Books.

<sup>161</sup> Holsti, O. R., & George, A. L. (1975). The effects of stress on the performance of foreign policy-makers. *Political Science Annual*, 6(3), 255.

<sup>162</sup> Rastegary, H., & Landy, F. J. (1993). The interactions among time urgency, uncertainty, and time pressure. In: *Time pressure and stress in human judgment and decision making* (pp. 217-239). Springer, Boston, MA.

to externally imposed time constraints determined on a situation-by-situation basis. Time urgency, by contrast, refers to internally imposed time constraints determined on an individual basis, often as a durable feature of behavior or personality.

One consistent finding has been that some individuals—sometimes called “time urgent” individuals—respond positively (i.e., they tend to perform better in decision tasks) to time constraint-induced arousal, but are generally averse to and adversely affected by uncertainty due to an over-reliance on previously successful strategies in nonetheless novel situations.<sup>163 164</sup> Individuals with low time urgency are the opposite: they generally thrive in uncertain situations, but perform poorly under time pressure.<sup>165 166</sup> This general relationship highlights the fact that time pressure has both material and subjective qualities; as a result, the complexity or novelty of a task (a stressor related to task uncertainty<sup>167</sup>) can modulate perceived time pressure even as the absolute time remaining for task completion is held fixed.<sup>168</sup> For both high and low time urgency individuals, however, a high level of time pressure is likely to produce negative emotions and lower subjective well-being.<sup>169 170</sup>

Across all types of individuals, time pressure exhibits a concave parabolic (“inverted U”) relationship with creativity and motivation<sup>171 172</sup>: at very low levels of time pressure, the focusing quality of time<sup>173</sup> is absent and tasks fail to hold individuals’ attention<sup>174</sup>; at very high levels of time pressure, stress is distracting<sup>175</sup> and a considerable portion of individuals’ finite

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<sup>163</sup> Smock, C. D. (1955). The influence of psychological stress on the "intolerance of ambiguity". *The Journal of Abnormal and Social Psychology*, 50(2), 177.

<sup>164</sup> Price, V.A. (1982). *Type A behavior pattern: A model for research and practice*. New York: Academic Press.

<sup>165</sup> MacCrimmon, K. R., and Taylor, R. N. (1976). Decision making and problem solving. In: M. D. Dunnette (Ed.), *Handbook of industrial and organizational psychology* (pp. 1397–1453). Chicago: Rand McNally College Publishing Company.

<sup>166</sup> Keinan, G., Friedland, N., Kahneman, D., & Roth, D. (1999). The effect of stress on the suppression of erroneous competing responses. *Anxiety, Stress, & Coping*, 12, 455-476.

<sup>167</sup> Rastegary, H., & Landy, F. J. (1993). The interactions among time urgency, uncertainty, and time pressure. In: *Time pressure and stress in human judgment and decision making*. Springer, Boston, MA. p. 223.

<sup>168</sup> Holsti, O. R. (1971). Crisis, stress, and decision making. *InterTUItioTUII Social Science JourTUII*, 23, 53-67.

<sup>169</sup> Gärling, T., Gamble, A., Fors, F., & Hjerm, M. (2015). Emotional well-being related to time pressure, impediment to goal progress, and stress-related symptoms. *Journal of Happiness Studies*, 17(5).

<sup>170</sup> Ng, W., Diener, E., Arora, R., & Harter, J. (2009). Affluence, feelings of stress, and well-being. *Social Indicators Research*, 94, 257–271.

<sup>171</sup> Baer, M., & Oldham, G. R. (2006). The curvilinear relation between experienced creative time pressure and creativity: Moderating effects of openness to experience and support for creativity. *Journal of Applied Psychology*, 91, 963-970.

<sup>172</sup> Byron, K., Khazanchi, S., & Nazarian, D. (2010). The relationship between stressors and creativity: A meta-analysis examining competing theoretical models. *Journal of Applied Psychology*, 95, 201-212.

<sup>173</sup> Chajut, E., & Algom, D. (2003). Selective attention improves under stress: Implications for theories of social cognition. *Journal of Personality and Social Psychology*, 85, 231-248.

<sup>174</sup> Gardner, D. G. (1990). Task complexity effects on non-task-related movements: A test of activation theory. *Organizational Behavior and Human Decision Processes*, 45, 209-231.

<sup>175</sup> Kelly, J. R., Jackson, J. W., & Hutson-Comeaux, S. L. (1997). The effects of time pressure and task differences on influence modes and accuracy in decision-making groups. *Personality and Social Psychology Bulletin*, 23, 10-22.

mental resources<sup>176 177</sup> must be directed to monitoring the progress of the task itself.<sup>178</sup> Moderate levels of time pressure, by contrast, can promote goal setting and achievement,<sup>179</sup> ultimately leading to a greater sense of personal accomplishment associated with greater subjective well-being.<sup>180</sup>

The degree to which perceived time constraints affect choice also depends on characteristics of the listener including their worldview, prior experience, and values. It is well understood that one's group membership exerts a strong influence on one's political views<sup>181</sup> and the way that new information is assimilated into one's existing worldview.<sup>182</sup> As a result, the subject of time pressure framing affects the degree to which a message's time pressure is internalized: increasingly urgent climate messaging might be readily labeled as alarmism by those least likely to support climate mitigation (e.g., "climate skeptics") and may be most arousing to those already alarmed about climate change, thereby increasing their affective stress to counterproductively high levels—with the relationship between stress and choice quality following, as above, a concave parabolic ("inverted U") pattern.<sup>183</sup> Evidence also suggests that individuals reporting a greater sense of ignorance about climate change were more likely to actively avoid hearing negative information about its effects<sup>184</sup> and those most distressed by climate change react most negatively to climate activism.<sup>185</sup> Finally, prior experience mediates both the development of individuals' response heuristics<sup>186</sup> and their willingness to accept attributional claims.<sup>187</sup> The fundamental importance of individual traits to the integration and response to frames and information

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<sup>176</sup> Muraven, M., Tice, D. M., & Baumeister, R. F. (1998). Self-control as a limited resource: Regulatory depletion patterns. *Journal of Personality and Social Psychology*, 74, 774-789.

<sup>177</sup> Vohs, K. D., & Heatherton, T. F. (2000). Self-regulatory failure: A resource-depletion approach. *Psychological Science*, 11, 249-254.

<sup>178</sup> Baumeister, R. F., Bratslavsky, E., Muraven, M., & Tice, D. M. (1998). Ego depletion: Is the active self a limited resource? *Journal of Personality and Social Psychology*, 74, 1252-1265.

<sup>179</sup> Ohly, S., & Fritz, C. (2010). Work characteristics, challenge appraisal, creativity and proactive behavior: A multi-level study. *Journal of Organizational Behavior*, 31, 543-565.

<sup>180</sup> Zivnuska, S., Kiewitz, C., Hochwater, W. A., Perrewe, P. L., & Zellars, K. L. (2002). What is too much or too little? The curvilinear effects of job tension on turnover intent, value attainment, and job satisfaction. *Journal of Applied Social Psychology*, 32, 1344-1360.

<sup>181</sup> Cohen, G. L. (2003). Party over policy: The dominating impact of group influence on political beliefs. *Journal of Personality and Social Psychology*, 85(5), 808.

<sup>182</sup> Lord, C. G., Ross, L., & Lepper, M. R. (1979). Biased assimilation and attitude polarization: The effects of prior theories on subsequently considered evidence. *Journal of Personality and Social Psychology*, 37(11), 2098.

<sup>183</sup> Hermann, M. G. (1979). Indicators of stress in policymakers during foreign policy crises. *Political Psychology*, 1(1), 27-46.

<sup>184</sup> Shepherd, S., & Kay, A. (2012). On the perpetuation of ignorance: System dependence, system justification, and the motivated avoidance of sociopolitical information. *Journal of Personality and Social Psychology*, 102, 264-280.

<sup>185</sup> Davenport, L. (2017). *Emotional resiliency in the era of climate change*. London: Kingsley.

<sup>186</sup> Sattler, D. N., Kaiser, C. F., & Hittner, J. B. (2000). Disaster Preparedness: Relationships Among Prior Experience, Personal Characteristics, and Distress 1. *Journal of Applied Social Psychology*, 30(7), 1396-1420.

<sup>187</sup> Weber, E. U. (2006). Experience-based and description-based perceptions of long-term risk: Why global warming does not scare us (yet). *Climatic change*, 77(1-2), 103-120.

There are a number of reasons why a climate crisis message, even if believed by the listener, might induce a behavioral boomerang effect.<sup>188</sup> First, crisis messaging that underscores the pervasiveness of anthropogenic interference with the climate system might reinforce the normalcy of such interference.<sup>189</sup> Second, in the case of messaging intended to affect consumption behavior, such messaging may induce trait or psychological reactance—i.e., an enhanced attraction to “forbidden fruits” or newly perceived scarcity.<sup>190 191 192</sup> Third, the ubiquity of targeted behavioral messaging may lead to an individual’s inability to suppress thoughts about the proscribed behaviors.<sup>193 194</sup> Finally, the assignment of responsibility for potential harms—whether to oneself or distant others—is likely to induce emotions such as guilt or challenges to one’s preferred view of the world as inherently fair or just. As argued by just-world theory,<sup>195</sup> individuals facing such emotions are likely to engage in motivated moral reasoning<sup>196</sup> to allay recrimination and minimize their perceived complicity in the presented emergency.<sup>197</sup> Motivated reasoning is also likely to increase overall polarization in beliefs about climate change.<sup>198</sup>

## 5.2. Cognitive processes

Assembling a sequence of actions to respond to climate change involves judgement among numerous response alternatives across time, type, and intensity. Emphasis on the time sensitivity of climate change mitigation or adaptation can potentially affect one’s choice of an optimal response path by modulating one’s (1) subjective discount rate, (2) approach toward risk or uncertainty, (3) reliance on heuristics in social aggregation, or (4) preferred types of mitigation or adaptation activities.

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<sup>188</sup> Byrne, S. and Hart, P.S. (2009). The boomerang effect: A synthesis of findings and a preliminary theoretical framework. In: Beck, C.A. (ed.) *Communication Yearbook 33*. New York, NY: Routledge, pp. 3–37.

<sup>189</sup> Cialdini, R. B. (2003). Crafting normative messages to protect the environment. *Current Directions in Psychological Science*, 12(4), 105–109.

<sup>190</sup> Bushman, B. J., & Stack, A. D. (1996). Forbidden fruit versus tainted fruit: Effects of warning labels on attraction to television violence. *Journal of Experimental Psychology: Applied*, 2(3), 207.

<sup>191</sup> Brock, T. C. (1968). Implications of commodity theory for value change. In: *Psychological Foundations of Attitudes*. Academic Press. pp. 243–275.

<sup>192</sup> Brehm, J. W. (1966). *A Theory of Psychological Reactance*. Academic Press.

<sup>193</sup> Wegner, D. M. (1994). Ironic processes of mental control. *Psychological Review*, 101(1), 34.

<sup>194</sup> Lakoff, G. (2014). *The all new don't think of an elephant!: Know your values and frame the debate*. Chelsea Green Publishing.

<sup>195</sup> Feinberg, M., & Willer, R. (2011). Apocalypse soon? Dire messages reduce belief in global warming by contradicting just-world beliefs. *Psychological science*, 22(1), 34-38.

<sup>196</sup> Ditto, P. H., Pizarro, D. A., & Tannenbaum, D. (2009). Motivated moral reasoning. *Psychology of Learning and Motivation*, 50, 307-338.

<sup>197</sup> Stoll-Kleemann, S., O’Riordan, T., & Jaeger, C. C. (2001). The psychology of denial concerning climate mitigation measures: evidence from Swiss focus groups. *Global Environmental Change*, 11(2), 107-117.

<sup>198</sup> Hart, P. S., & Nisbet, E. C. (2012). Boomerang effects in science communication: How motivated reasoning and identity cues amplify opinion polarization about climate mitigation policies. *Communication Research*, 39(6), 701-723.

Numerous studies across psychology and economics explore the complex interaction between time pressure and the rate at which individuals discount future costs and benefits. Dual-systems psychological models of decision making describe choice as the outcome of an interplay between a system of automatic, unconscious, faster, affective judgements (occasionally, “System 1”) and a system of deliberative, conscious, slower, cognitive choice (“System 2”).<sup>199 200 201</sup> In these models, the judgements of the affective mental system are tempered by the considerations of the cognitive system, however the degree to which affective judgements are reviewed by the cognitive system is affected by many things, including stress, time pressure, or even addiction.<sup>202</sup> <sup>203</sup> In economic parameterizations of this relationship, affective judgement is modeled as exhibiting strong present bias,<sup>204</sup> whereas cognitive choice exhibits a weaker but still positive discounting of distant costs and benefits.<sup>205 206 207 208 209</sup> Laboratory experiments that seek to test these models typically vary the time available to subjects while they weigh binary alternatives. These studies have found that time pressure reduces interpersonal bargaining efficiency and leads to greater disagreement in negotiation.<sup>210 211 212 213</sup> In games with coordinated optima, however, time pressure generally increases cooperation.<sup>214 215</sup> These studies also find that time pressure enhances the endowment effect (a greater aversion to losses than motivation toward

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<sup>199</sup> Evans, J. S. B., & Stanovich, K. E. (2013). Dual-process theories of higher cognition advancing the debate. *Perspectives on Psychological Science*, 8(3), 223–241.

<sup>200</sup> Kahneman, D. (2003). A perspective on judgment and choice: Mapping bounded rationality. *American Psychologist*, 58(9), 697–720.

<sup>201</sup> Kahneman, D. (2011). *Thinking, fast and slow*. New York: Farrak, Straus and Giroux.

<sup>202</sup> Finucane, et al., 2000.

<sup>203</sup> Kahneman, D., & Frederick, S. (2002). *Representativeness revisited: Attribute substitution in intuitive judgment*. Cambridge University Press.

<sup>204</sup> Laibson, D. (1997). Golden eggs and hyperbolic discounting. *Quarterly Journal of Economics*, 112(2), 443–477.

<sup>205</sup> O’Donoghue, T., & Rabin, M. (1999). Doing it now or later. *American Economic Review*, 89(1), 103–124.

<sup>206</sup> Gul, F., & Pesendorfer, W. (2001). Temptation and self-control. *Econometrica*, 69(6), 1403–1435.

<sup>207</sup> Loewenstein, G., & O’Donoghue, T. (2004). Animal spirits: Affective and deliberative processes in economic behavior. Available at SSRN: <<https://ssrn.com/abstract=539843>>.

<sup>208</sup> Fudenberg, D., & Levine, D. K. (2006). A dual-self model of impulse control. *American Economic Review*, 96(5), 1449–1476.

<sup>209</sup> Thaler, R. H., & Shefrin, H. M. (1981). An economic theory of self-control. *Journal of Political Economy*, 89(2), 392–406.

<sup>210</sup> Sutter, M., Kocher, M., & Strauß, S. (2003). Bargaining under time pressure in an experimental ultimatum game. *Economics Letters*, 81(3), 341–347.

<sup>211</sup> Karagözoglu, E., & Kocher, M. G. (2015). Bargaining under time pressure. Munich Discussion Paper No. 2015-21.

<sup>212</sup> Cappelletti, D., Güth, W., & Ploner, M. (2011). Being of two minds: Ultimatum offers under cognitive constraints. *Journal of Economic Psychology*, 32(6), 940–950.

<sup>213</sup> Kocher, M. G., & Sutter, M. (2006). Time is money – Time pressure, incentives, and the quality of decision-making. *Journal of Economic Behavior & Organization*, 61(3), 375–392.

<sup>214</sup> Rand, D. G., Greene, J. D., & Nowak, M. A. (2012). Spontaneous giving and calculated greed. *Nature*, 489(7416), 427–430.

<sup>215</sup> Rand, D. G., Greene, J. D., & Nowak, M. A. (2013). Rand et al. reply. *Nature*, 498(7452), E2–E3.

gains of similar magnitude)<sup>216</sup> and heuristic reasoning.<sup>217</sup> Overall, evidence on the impact of time pressure on intertemporal discounting, despite clear theoretical predictions, is mixed,<sup>218 219</sup> with some studies suggesting that empirically conflicting results might be the result of a tripartite relationship between mood, discounting, and time pressure<sup>220</sup> and others suggesting an unexplored connection to underlying cognitive load.<sup>221</sup> More work is needed to parse the complex terrain of affect, cognition, and urgency in settings of lagged costs and benefits. In the context of environmental decisions, some suggest individuals' concerns about legacy may also temper the degree to which they discount the future benefits of climate action,<sup>222</sup> though the relationship of this motivation with respect to time pressure is unexplored.

To the extent that the time pressure framing of climate change enhances a listener's sense of uncertainty about impacts or potential solutions, it may induce optimism bias.<sup>223 224</sup> For instance, most audiences systematically underestimate the degree of agreement indicated by the IPCC's uncertainty statements,<sup>225</sup> indicating a large potential scope for this source of cognitive bias. There is some evidence that, at least over a short time horizon, increased time pressure can lead to an increased willingness to bear risks.<sup>226 227 228</sup>

Time pressure can also affect the relative weights that an individual places on the damages or benefits expected to be experienced by different people in different places. At baseline, group membership is a strong predictor of the intensity with which an individual considers a given cost

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<sup>216</sup> Kirchler, M., Andersson, D., Bonn, C., Johannesson, M., Sørensen, E. Ø., Stefan, M., & Västfjäll, D. (2017). The effect of fast and slow decisions on risk taking. *Journal of Risk and Uncertainty*, 54(1), 37-59.

<sup>217</sup> Kocher, M. G., Pahlke, J., & Trautmann, S. T. (2013). Tempus fugit: Time pressure in risky decisions. *Management Science*, 59(10), 2380–2391.

<sup>218</sup> Ebert, J. E. (2001). The role of cognitive resources in the valuation of near and far future events. *Acta Psychologica*, 108(2), 155-171.

<sup>219</sup> Lindner, F., & Rose, J. (2017). No need for more time: Intertemporal allocation decisions under time pressure. *Journal of Economic Psychology*, 60, 53-70.

<sup>220</sup> Daly, M., Harmon, C. P., & Delaney, L. (2009). Psychological and biological foundations of time preference. *Journal of the European Economic Association*, 7, 659–669.

<sup>221</sup> Hinson, J. M., Jameson, T. L., & Whitney, P. (2003). Impulsive decision making and working memory. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 29, 298–306.

<sup>222</sup> Zaval, L., Markowitz, E. M., & Weber, E. U. (2015). How will I be remembered? Conserving the environment for the sake of one's legacy. *Psychological Science*, 26(2), 231-236.

<sup>223</sup> Weinstein, N. D. (1980). Unrealistic optimism about future life events. *Journal of Personality and Social Psychology*, 39(5), 806.

<sup>224</sup> Sharot, T. (2011). The optimism bias. *Current Biology*, 21(23), R941-R945.

<sup>225</sup> Budescu, D. V., Broomell, S., & Por, H. H. (2009). Improving communication of uncertainty in the reports of the Intergovernmental Panel on Climate Change. *Psychological Science*, 20(3), 299-308.

<sup>226</sup> Ben Zur, H., & Breznitz, S. J. (1981). The effect of time pressure on risky choice behavior. *Acta Psychologica*, 47, 89–104.

<sup>227</sup> Hu, Y., Wang, D., Pang, K., Xu, G., & Guo, J. (2015). The effect of emotion and time pressure on risk decision-making. *Journal of Risk Research*, 18(5), 637-650.

<sup>228</sup> Madan, C. R., Spetch, M. L., & Ludvig, E. A. (2015). Rapid makes risky: Time pressure increases risk seeking in decisions from experience. *Journal of Cognitive Psychology*, 27(8), 921–928.

or benefit when choosing between alternative actions.<sup>229</sup> For example, individuals are more likely to support climate change mitigation or adaptation when it is presented in a way that emphasizes personal health consequences rather than consequences on more distant systems.<sup>230</sup> Identity also plays an important role in cooperation. While the social heuristics hypothesis holds that individuals under time pressure are overall more likely to cooperate,<sup>231</sup> the effect of time pressure on cooperation across groups is more nuanced.<sup>232</sup> As discussed above, time pressure leads to greater reliance on heuristics—in this instance, group heuristics that inform an individual’s perception of those with whom they must cooperate. Available heuristics may either harm<sup>233</sup> or improve<sup>234</sup> decision quality depending on the degree to which they align with or contradict optimal choice.<sup>235</sup>

Despite advances made in understanding the connection between cognition and time pressure, the degree to which these patterns persist in the context of climate relevant decisions—characterized by significant time lags, nonlinearities, uncertainty, and the need for cooperation—is unclear. Efforts to understand the impact of time pressure on cognition in this setting must connect two parallel literatures: first, the literature relating cognition to time pressure; second, the literature exploring cognition in environmental contexts, frequently characterized by the involvement of multiple actors and complexity in time and space.

Finally, the emergency framing of climate change can influence climate decision making through two social cognitive channels: first, by foreclosing democratic debate on alternatives; and second, by legitimating or enhancing the apparent inevitability of particular solutions. Both processes entail a shallowing of our ecological mind<sup>236</sup>—an obscuring of critiques of the core issues that have led to climate change, including the tendency of capitalist production to externalize costs and the modern orientation toward nature as either infinite or fully manageable. The emergency frame, by shrinking the apparent time remaining for a more measured response,

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<sup>229</sup> Levine, M., Prosser, A., Evans, D., & Reicher, S. (2005). Identity and emergency intervention: How social group membership and inclusiveness of group boundaries shape helping behavior. *Personality and Social Psychology Bulletin*, 31(4), 443-453.

<sup>230</sup> Myers, T. A., Nisbet, M. C., Maibach, E. W., & Leiserowitz, A. A. (2012). A public health frame arouses hopeful emotions about climate change. *Climatic Change*, 113(3-4), 1105-1112.

<sup>231</sup> Rand, D. G., Peysakhovich, A., Kraft-Todd, G. T., Newman, G. E., Wurzbacher, O., Nowak, M. A., & Greene, J. D. (2014). Social heuristics shape intuitive cooperation. *Nature Communications*, 5(1), 1-12.

<sup>232</sup> Cone, J., & Rand, D. G. (2014). Time pressure increases cooperation in competitively framed social dilemmas. *PLoS one*, 9(12).

<sup>233</sup> Lam, S. F., Chiu, C. Y., Lau, I. Y. M., Chan, W. M., & Yim, P. S. (2006). Managing intergroup attitudes among Hong Kong adolescents: Effects of social category inclusiveness and time pressure. *Asian Journal of Social Psychology*, 9(1), 1-11.

<sup>234</sup> Cone, J., & Rand, D. G. (2014). Time pressure increases cooperation in competitively framed social dilemmas. *PLoS one*, 9(12).

<sup>235</sup> Rand, D. G. (2016). Cooperation, fast and slow: Meta-analytic evidence for a theory of social heuristics and self-interested deliberation. *Psychological science*, 27(9), 1192-1206.

<sup>236</sup> Naess, A. (1973). The shallow and the deep, long-range ecology movement. A summary. *Inquiry*, 16(1-4), 95-100.



lends legitimacy to actions that may exhibit an “ironic perversity of a ‘pragmatism’ that is no different, in principle, from the problems [they] hope to resolve.”<sup>237</sup> Actors might deploy emergency frames to “power”<sup>238</sup> through ordinary deliberative processes; in such environments, “policy is fast-tracked; participation, democratic deliberation, cost–benefit assessments, environmental impact assessments are cast aside or bypassed.”<sup>239</sup> <sup>240</sup> Within the logic of emergency, actors may feel encouraged to prioritize large-scale technical solutions—a kind of techno-salvation—that promise to bring about a quick, cheap solution to the crisis state.<sup>241</sup> <sup>242</sup> These observations mirror Frederickson’s broaden-and-build theory, which emphasizes that negative emotions often narrow an individual’s action repertoire (e.g., calling for “fight” or “flight”) while positive emotions broaden it, leading to non-specific interest in play, exploration, or ideation.<sup>243</sup> A narrow, techno-salvationist approach toward crisis resolution is both reflected in and reinforced<sup>244</sup> <sup>245</sup> by the language we adopt to describe the era in which this crisis state was born: the “Anthropocene,” a self-fulfilling prophecy<sup>246</sup> of our place in the world.

## 6. Conclusion

In this paper, we explored the mechanisms behind and implications of the increasing urgency of climate change. First, we discussed relevant distinctions between the separate but related notions of urgency, crisis, and emergency. Second, we examined the treatment of the concept of time pressure in several bodies of social science literature. Third, we presented the results of a bibliometric analysis of the time pressure framing of climate change in academic and popular

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<sup>237</sup> Bookchin, M. (1986). *The Modern Crisis*. Montreal: Black Rose Books.

<sup>238</sup> Boin, A., Stern, E., & Sundelius, B. (2016). *The politics of crisis management: Public leadership under pressure*. Cambridge University Press.

<sup>239</sup> Van Buuren, A., Vink, M., & Warner, J. (2016). Constructing authoritative answers to a latent crisis? Strategies of puzzling, powering and framing in Dutch climate adaptation practices compared. *Journal of Comparative Policy Analysis: Research and Practice*, 18(1), 70-87.

<sup>240</sup> For now, however, it appears large-scale geoengineering has remained of only indirect interest. Consider a recent report by the United States Government Accountability Office which seeks only more information on “the climate and a way to determine when a ‘climate emergency’ is reached . . . information on climate system thresholds, reversibility, and abrupt changes to inform societal debate and decision-making over what would constitute a ‘climate emergency’ and whether deployment of a geoengineering approach would be merited.” See: United States Government Accountability Office. Climate engineering: technical status, future directions, and potential responses. Washington, DC, 2011. <<http://www.gao.gov/products/GAO-11-71>>

<sup>241</sup> Markusson, N., Ginn, F., Singh Ghaleigh, N., & Scott, V. (2014). ‘In case of emergency press here’: framing geoengineering as a response to dangerous climate change. *Wiley Interdisciplinary Reviews: Climate Change*, 5(2), 281-290.

<sup>242</sup> Thomas, J., & Fitzgerald, P. (2008). Technofixes: climate solution or corporate scam? *New Internationalist*, 21-24.

<sup>243</sup> Fredrickson, B. L. (2004). The broaden–and–build theory of positive emotions. *Philosophical Transactions of the Royal Society of London. Series B: Biological Sciences*, 359(1449), 1367–1377.

<sup>244</sup> Wittgenstein, L. (1922). *Tractatus logico-philosophicus*. Kegan Paul, London.

<sup>245</sup> Winch, P. (1990). *The idea of a social science and its relation to philosophy*. Psychology Press.

<sup>246</sup> Merton, R. K. (1948). The self-fulfilling prophecy. *The Antioch Review*, 8(2), 193-210.

sources. Finally, we summarized some findings from psychology and related literature that suggest ways in which time pressure framing might affect climate-relevant decision making.

We find that climate change has come to be framed as a phenomenon of increasing urgency over the past 20 years, a trend reflected in the terminology used by the popular press, social movements, academic articles, and the international climate policy regime (including IPCC's Fifth Assessment Report, the Paris Agreement, and Sustainable Development Goal 13). Increases in the use of time pressure language when discussing climate change were especially pronounced in two periods, the first from 2006 to 2009 and the second from 2017 to the present; however, in the more recent period, articles in the popular press and social movements came to frame the time pressure of climate change specifically as a “crisis” or “emergency.” This particular framing of climate change has both locutionary and illocutionary force—that is, it both describes a phenomenon (giving form to a growing divide between expert assessment and realized policy changes) and intends to change behavior (reflecting a hope that time pressure framing will motivate more mitigation and adaptation). In parsing these elements amidst an ambiguity of intention, we find the perspective of securitization helpful for its emphasis on agenda setting and the promotion of action.

As we have shown in Section 5 of this paper, however, depictions of crises do not sit comfortably with a sense of empowerment. While those who perceive greater risks or are better informed about climate change are more likely to support policies to address it, considering risk and urgency in isolation ignores a wide range of negative affective responses and changes in cognition that accompany time pressure and may in the end undermine motivation to act. Rich but often disconnected literatures on time pressure, pro-environmental behavior, and cognition highlight the importance of habit, individuals' finite capacity for attention, affective stress, and impatience to choice under time pressure. However, they offer few predictions about the effect of a sudden and widespread emphasis on time pressure in the context of climate-relevant decisions. Inference is complicated by many overlapping sources of heterogeneity in message content,<sup>247</sup> listener vulnerability and self-efficacy, and the complexity with which these dynamics combine in collective choice and cooperation.<sup>248</sup> Further research to clarify this ambiguity is sorely needed.

Climate change is a global phenomenon with deep, personal effects. Many individuals and groups—activists, scientists, indigenous peoples, journalists, and those who experience heat waves, wildfires, coastal floods, and the like—bear knowledge of its effects, past and future, with a sense of concern and the hope of resolution. As these groups come together to construct

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<sup>247</sup> Gifford, R., & Comeau, L. A. (2011). Message framing influences perceived climate change competence, engagement, and behavioral intentions. *Global Environmental Change*, 21(4), 1301–1307.

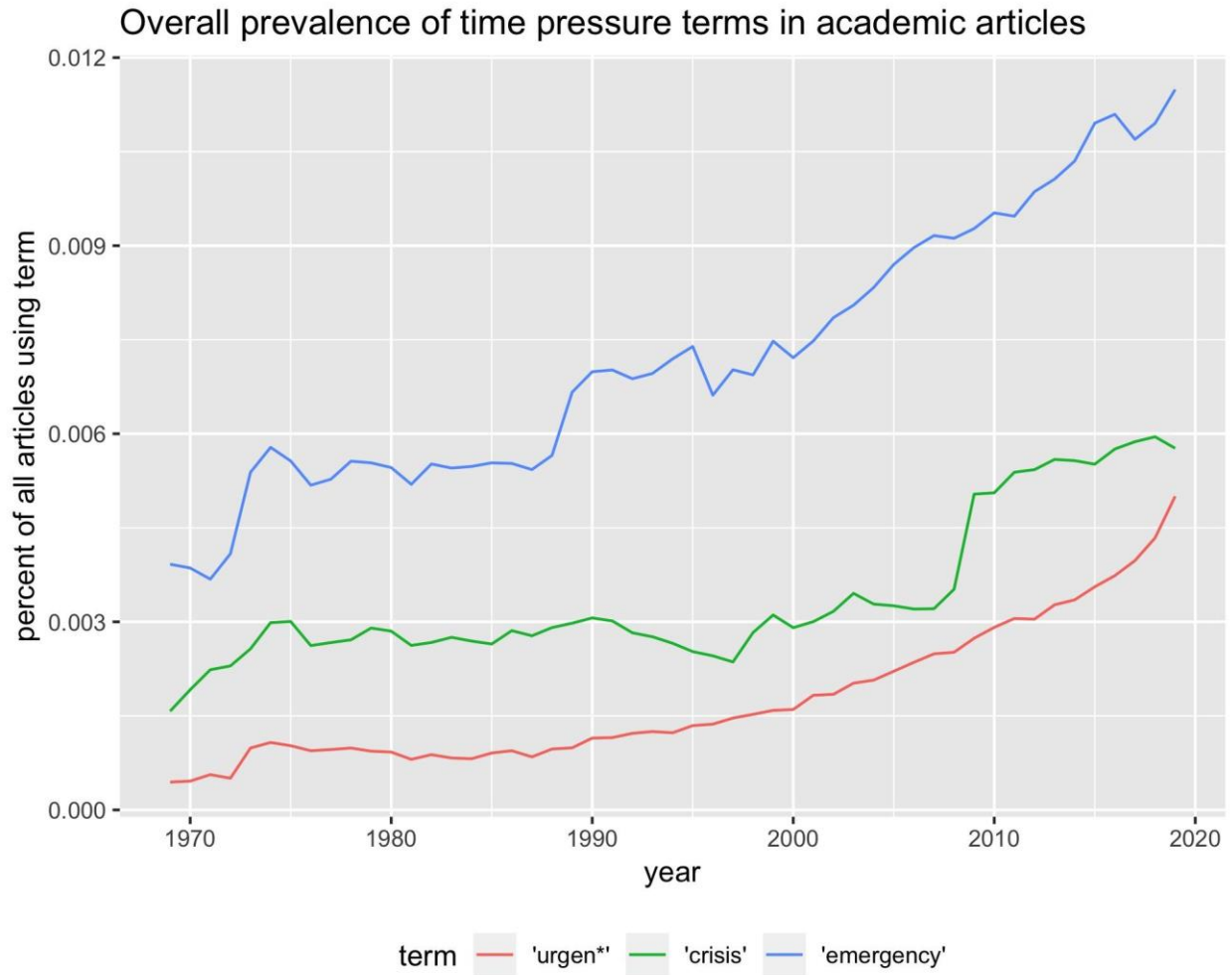
<sup>248</sup> Sawitri, D. R., Hadiyanto, H., & Hadi, S. P. (2015). Pro-environmental behavior from a social cognitive theory perspective. *Procedia Environmental Sciences*, 23, 27–33.

an image of the challenge that humanity faces, we must be careful to tread a thin line between alarmism and undue optimism. If “crisis consists precisely in the fact that the old is dying and the new cannot be born,”<sup>249</sup> the world of climate policy is rich with possibility and so requires our care.

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<sup>249</sup> Gramsci, A., & Hoare, Q. (1971). *Selections from the prison notebooks* (p. 276). London: Lawrence and Wishart.

*Appendix A: Prevalence of time pressure terms across the academic literature as a whole*



Data: Scopus

***Appendix B: Prevalence of time pressure terms in prominent documents from the international climate change policy regime***

The linguistic trends discussed in the academic and popular presses are mirrored in the touchstone products of the international environmental policy regime, especially the IPCC’s various Assessment and Special Reports and the primary international agreements of the UNFCCC, as shown in the table below.

<b>Count of descriptions of climate change as: (direct and indirect occurrences per 100,000 words)</b>	<b>“urgent” or requiring “urgency”</b>	<b>a “crisis”</b>	<b>an “emergency”</b>	<b>word count</b>
<i>Prominent IPCC documents</i>				
AR1 (1990/1992)	9.81 2.94	0 0.98	0 1.96	101952
“Radiative Forcing of Climate Change and An Evaluation of the IPCC IS92 Emission Scenarios” (1995)	0 0	0 1.61	0 0	186332
AR2 (1995) (SPM only)	0 0	0 0	0 0	44372
“The Regional Impacts of Climate Change: An Assessment of Vulnerability” (1997) (SPM only)	0 0	0 0	0 0	18716
“Aviation and the Global Atmosphere” (1999) (SPM only)	0 0	0 0	0 0	10618
“Emissions Scenarios” (2000)	0 0	0 0.86	0 0	348071
“Land Use, Land-Use Change, and Forestry” (2000) (SPM only)	0 0	0 0	0 0	16769

“Methodological and Technological Issues in Technology Transfer” (2000)	0.23 0	0 0	0 0	437904
AR3 (2001) Synthesis Report	0.85 0.43	0 0	0 1.28	235026
“Carbon Dioxide Capture and Storage” (2005)	0 0	0 0	0 0.35	287676
“Safeguarding the Ozone and the Global Climate System” (2005)	0.33 0	0 0	0 0	300986
AR4 (2007) Synthesis Report	0 0	0 0	0 3.24	61646
“Renewable Energy Sources and Climate Change Mitigation” (2012)	0 0.19	0 2.14	0 00	841617
“Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation” (2012)	2.09 1.71	0.57 1.90	0 21.25	527132
AR5 (2015) Synthesis Report	1.04 0	0 0	0 3.11	96353
“Global Warming of 1.5 °C” (2018)	4.12 0	0 0.59	0 1.57	509500
“Climate Change, Desertification, Land Degradation, Sustainable Land Management, Food Security, and Greenhouse gas fluxes in Terrestrial Ecosystems” (2019)	0.25 1.11	0 2.59	0 0.86	810216
“The Ocean and Cryosphere in a Changing Climate” (2019)	1.12 0	0 0.16	0 3.04	625268
<i>Primary agreements of the UNFCCC</i>				

UNFCCC founding charter (1992)	0 0	0 0	0 0	8556
Kyoto Protocol (1997)	0 0	0 0	0 0	8687
Paris Agreement (2015)	54.33 0	0 0	0 6.04	16566
<i>Other documents of interest</i>				
IPBES Global Assessment Report on Biodiversity and Ecosystem Services (2019)	0.56 0.19	0 0	0 0	537884

### *Appendix C: Methodological note for Figures 4 and 5*

In both the academic literature and popular press, “crisis” articles outnumber both “urgency” and “emergency” articles in naive counts, but this apparent preference in the academic literature disappears when the semantic context of the time pressure term is considered: about one-third of academic “crisis” articles discuss climate change merely as one of a list of drivers of some other phenomenon (most frequently an “energy,” “biodiversity,” or “financial” crisis) which is itself the primary topic of the article. Around one-third of the academic “emergency” articles also simply discuss the relevance of climate change for “emergency preparedness,” “emergency planning,” “emergency management,” or “emergency services.”

By contrast, this is not observed in “urgency” articles: nearly all articles analyzed in this study use “urgency” or “urgent” to describe climate change or its direct effects. For example, of the 40 most highly cited academic articles in which “urgency” or “urgent” appear in close proximity to a climate change term in either the article’s title or abstract:

- 14 express a generalized sense of “urgency” given either the large predicted future or realized past impacts of climate change—using phrases such as “most urgent problem of our time” and “urgent global warming challenge”
- 10 express a sense of urgency for further research, generally that clarifies the future impacts of climate change—using phrases such as “urgency of better models” and “data scarcity presents an urgent challenge”
- 10 highlight the urgent need to mitigate climate change through emissions reductions or technological change—using phrases such as “urgent need to decarbonize” and “urgently install new renewable energy”
- 6 declare an urgent demand to adapt to climate change—using phrases such as “urgent need to plan for flooding” and “urgent need for better fishery management practices”

Once we constrain our analysis to instances where time pressure language is used to directly describe climate change, we find that the academic community has exhibited a strong preference for “urgency” over “crisis” and “emergency” each year of the past twenty. We do not find a significant effect for popular press articles when performing this adjustment, though the data we present for the popular press are in this final, adjusted form for ease of comparison.