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Materiality in the Long Now: Navigating the Intersection of Decision-Making, Time, and Strategy

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Articles

Materiality in the Long Now: Navigating the Intersection of Decision-Making, Time, and Strategy

Daniel M. Labovitz & Alexander Kontoleon*

ABSTRACT

Existing formulations of materiality in the federal securities laws contain an inherent limitation because they don't adequately account for how risks and opportunities change over time. This can mislead investors looking to understand how well a company is poised to avoid long-dated risks and take advantage of evolving opportunities because those risks and opportunities don't neatly fit into the rubric of "likelihood of occurrence times magnitude of harm equals materiality." This is because the likelihood of any long-dated risk occurring within a short reporting time frame will

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always approach zero, which means the traditional model of materiality will always classify it as not material. What is lost is that over time, decisions that a company could make that would mitigate or eliminate longer term risks won't be recognized and taken in time. This can result in the company having less or zero flexibility when the realization that the likelihood and impact will be greater than previously anticipated. We propose addressing the materiality problem by applying a different analytical framework, drawn from modern decision theory, that would complement the existing understanding of materiality but provide new and useful insights about the impact of time on decision-making and risk.

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INTRODUCTION

The basic time unit of materiality in law is what musician and producer Brian Eno called the “Short Now.” Thirty years ago, Eno proposed that time and space have variable boundaries in our lives—you can conceive of “now” as what is happening in this exact moment, or you can expand your vision of “now” to include things that logically came before this moment and will logically extend out from this moment. The smaller the interval of time that you have in your conception of “now,” the more you are living in Eno’s short now, and conversely, the larger the interval, the more you are living in the “Long Now.”¹

Eno was not speaking in any legal capacity, but he raised an interesting point that resonates in legal thinking about risk and disclosure. Taking Eno’s theory as a jumping-off point, this Article posits that, as currently construed, the concept of materiality—the linchpin of federal securities law disclosures to investors—is hampered by its tight focus on the short now. Reliance on materiality prevents companies and investors from seeing, identifying, evaluating, and ultimately avoiding or mitigating risks that are not imminent or whose financial impact is contingent on societal-level or planetary-level events and occurrences—that is, risks that reside in the long now.

The standard definition of materiality, as it relates to disclosures by public companies, can be thought of broadly as patrolling the boundary between the short now and the long now. It asks what potential events or circumstances would meaningfully affect us or our companies’ finances in the short now. Anything that does not intrude on our short now is, in effect, a future problem and not one that we or our investors need worry about now. Ergo, it is not material.²

The problem, of course, is where to set that boundary. Some events logically live perpetually in the short now—the likelihood that

1. Brian Eno, *The Big Here and Long Now*, LONG NOW FOUND., <http://tinyurl.com/ywz8pw6b> [<https://perma.cc/R33U-4QSU>] (last visited Feb. 14, 2024). The spatial equivalent of the Short Now and Long Now is the concept of “here,” which can be defined as your room or your house, or could also encompass your street, neighborhood, town, state, country, continent, or planet, depending on context. Narrow views of “here”—e.g., “here in my room” or “here in my house”—would be examples of a “Small Here” while expansive views of “here”—e.g., “here in America,” or “here on Earth”—would be examples of a “Big Here.” Eno supposes that when it comes to our conceptions of time, we are capable of similarly narrow or expansive views of what constitutes “now” without fundamentally corrupting the meaning of the word “now” itself. *See id.*

2. This is obviously not the legal definition of materiality. *See infra* Section I.B.1. Our point is that as a practical matter, most things outside the short now (as defined by companies and the courts) don’t tend to meet one of the two key tests of classic materiality—the “substantial likelihood” test—and therefore the “short now” formulation can stand as a non-technical proxy for materiality.

a company's oil refinery will experience a major fire, for example, is never zero. Such disaster can strike at any time; the threat is not time-bound. Put differently, a major fire is a persistent "short now" problem we need to be ready to address, both to minimize its likelihood of happening (by adopting various safety measures) and to mitigate the financial impact if it does happen (by purchasing insurance, building redundant processing facilities elsewhere, etc.). Because fire poses a potential short now problem, investors are entitled to know how prepared we are and what the risks are if the worst happens.

Other events, meanwhile, persistently abide in the "long now": eventually, the microchips a company makes will become obsolete, but it will be a slow, gradual descent. There is no single day where this threat to the business will suddenly materialize. After all, buggy whip manufacturers did not collectively go out of business on the first day that Carl Benz applied for a patent on his "vehicle powered by a gas engine."³ Investors may generally grasp the long-term financial risk of obsolescence, but it is typically too diffuse of a risk for a company to disclose or talk much about.

"Classic" materiality does a good job of identifying short now problems. But it is comparatively less helpful at classifying distant (or long-term) threats or determining when they morph into near-term threats about which we must start worrying. Classic materiality favors lawyers and judges because it keeps them busy adjudicating where that line is. It is far less optimal, however, for CEOs and boards of directors—who have to make these judgments in the first place—and for investors who might need to know about them because it applies a binary test ("this thing is material or it is not material") to inherently subjective questions, namely "how close is this threat, and how prepared are we to handle it?"

This is not just another arcane legal thought experiment for lawyers to endlessly debate, especially when it comes to the realm of climate disclosures. Climate change is arguably the most existential long-term threat facing businesses today. Our problem when thinking about it is not a lack of imagination: most of us understand the broad, long-term impacts of climate change on all of us reasonably well, and we can generally extrapolate from that understanding that industry and society will be negatively impacted to varying degrees in varying ways.

3. See *Company Tradition: Company History: 1885–1886*, MERCEDES-BENZ GRP., <http://tinyurl.com/ydxj9ct8> [<https://perma.cc/49HS-BVP4>] (last visited Feb. 14, 2024). Not all of them are out of business even today: Westfield Whip Company in Westfield, Massachusetts, founded in 1884, still makes whips and equipment for dressage and equestrian competition. See *Welcome to Westfield Whip*, WESTFIELD WHIP, <http://tinyurl.com/3hxuhmav> [<https://perma.cc/7K6M-7JN3>] (last visited Feb. 14, 2024).

Numerous disclosure regimes require companies to identify and disclose climate risks. Most, if not all, rely on some form of materiality as the trigger for classification and disclosure. Despite a plethora of rubrics for evaluating climate risks, the problem remains that we humans do not strategize very well from the general to the specific: we are not well-equipped to project how climate change will affect specific businesses, to what degree, and over what time frame. It does not help that our primary tool for classifying threats—materiality—cannot determine precisely when or how an existential planetary threat like climate change will become a specific financial threat to a particular company. Of course, materiality’s inadequacies in the face of long-term threats do not render those long-term threats unimportant: after all, the time to fix a leaky roof is before it starts raining. But if it is true that “what gets measured gets managed,”⁴ then perhaps we could use a better tool.

Our thesis is that whereas most climate disclosure regimes aim to describe and categorize multi-variate long-term problems, they ultimately fall short because they still rely on classic materiality, which is inherently optimized for short-term binary classifications. This leads into a rhetorical trap that certain lawmakers and attorneys general have been happy to spring on climate disclosure proponents: “if a particular fact or event is material,” they ask, “why do we need a special disclosure regime? We already have a disclosure regime for materiality. And if something is not material under the existing standards, why does a company have to disclose it?”⁵ These are not unreasonable questions if the frame of reference is classic materiality

4. This quote is popularly attributed to management consultant Peter Drucker, but according to the Drucker Institute, Drucker himself never actually said this. See Paul Zak, *Measurement Myopia*, DRUCKER INST. (July 4, 2013), <http://tinyurl.com/5594huds> [<https://perma.cc/B2GS-76A6>]. The origins of the quote turn out to be more obscure, but it may derive from an 1883 quote by Lord William Thompson Kelvin, who said:

When you can measure what you are speaking about, and express it in numbers, you know something about it; but when you cannot measure it, cannot express it in numbers, your knowledge is of a meager and unsatisfactory kind; it may be the beginning of knowledge, but you may have scarcely in your thoughts advanced to the stage of science, whatever the matter may be.

See William Thompson Kelvin, *Electrical Units of Measurement* (May 3, 1883), in I POPULAR LECTURES AND ADDRESSES (London, Macmillan & Co. 1889), referenced in OXFORD ESSENTIAL QUOTATIONS (Oxford Univ. Press, 2d ed. 2016).

5. See, e.g., Hester M. Peirce, *We Are Not the Securities and Environment Commission – At Least Not Yet*, U.S. SEC. & EXCH. COMM’N (Mar. 21, 2022), <http://tinyurl.com/mrfzf8ha> [<https://perma.cc/VDM7-YXUG>] (“Some elements are missing, however, from [the SEC’s Climate Disclosure proposal, including] a credible rationale for such a prescriptive framework when our existing disclosure requirements already capture material risks relating to climate change.”).

and the short now. But since, as we suggest, classic materiality inadequately meets the task of classifying and analyzing long now challenges like planetary-level climate change, such questions are neither fair nor particularly useful to investors seeking to understand long-term risks.

Instead, we propose an alternative standard to address what we call “long-tail materiality.” Unlike classic materiality, long-tail materiality would add a third axis—time to reasonably mitigate or avoid problems—to the existing axes used to measure materiality, namely the likelihood of occurrence and severity of impact. Long-tail materiality would complement, not replace, classic materiality, which management could still use to describe risks that lie in the realm of the short now. But long-tail materiality would add a third dimension to the total mix of usable information in the marketplace: by adding this third dimension (time) to risk models, it would give both companies and investors a mechanism for describing, evaluating, and classifying longer-dated risks and challenges that could affect enterprise value over the long haul.

This Article will compare and contrast long-tail materiality with traditional materiality measures based on court precedents, Securities and Exchange Commission (“SEC”) proposals, rulemaking, pronouncements on the topic, and modern interpretations in climate disclosure frameworks such as the SASB,⁶ IFRS⁷ S1 and S2, TCFD,⁸ and others. Further, this Article will argue that long-tail materiality is a useful adjunct to classic materiality where companies and regulators evaluate climate risk and attempt to determine what to disclose to investors because it provides a framework for addressing long-term investors’ information and risk evaluation needs.

I. THE STATE OF MATERIALITY

A. *The Logic of Materiality*

The concept of materiality is central to the statutory and regulatory regime governing the purchase and sale of securities and the rights of holders and potential holders to information about those

6. Promulgated by the Sustainability Accounting Standards Board. *See* SUSTAINABILITY ACCT. STANDARDS BD., <http://tinyurl.com/357zcp5d> [<https://perma.cc/VAH5-5PXL>] (last visited Feb. 15, 2024).

7. Promulgated by the International Sustainability Standards Board. *See International Sustainability Standards Board*, INT’L FIN. REPORTING STANDARDS FOUND., <http://tinyurl.com/2hnhpup7> [<https://perma.cc/QXN8-KEN6>] (last visited Feb. 15, 2024).

8. Promulgated by the Task Force on Climate Related Financial Disclosure. *See* TASK FORCE ON CLIMATE-RELATED FINANCIAL DISCLOSURES, <https://tinyurl.com/3cmmhjbr> [<https://perma.cc/J35Y-633X>] (last visited Feb. 15, 2024).

securities. Despite this centrality, no single universally accepted definition of materiality exists.⁹

Materiality is rooted in the common law of fraud, where the measuring standards include (a) whether a misrepresentation of fact (or concealment or omission of a fact) was intended to induce reliance by the recipient of the fact (or omission), and (b) whether the recipient was justified in relying on the misrepresented fact (or omission).¹⁰ These elements—(1) intent to induce reliance by the maker of the statement and (2) justified reliance by the recipient—can be conceptually combined to form a working definition of what makes a statement “material,” which we can call M_1 .

M_1 : A statement of fact is material if the maker believes that the statement is important enough to the decision that the recipient would reasonably rely on it, and if the recipient believes the statement is sufficiently important to his or her thought process that it could influence the resulting decision.

An omission is the obverse of a statement, which leads to M_2 , a corollary to M_1 .

M_2 : An omission is material if the holder of the omitted fact knows that if the omitted fact were disclosed, it could (negatively) influence the recipient’s decision, and the recipient may reasonably rely on the non-existence of the omitted fact in making his or her decision.

M_1 and M_2 ’s common thread is the quality, or importance, of the information to the maker and the recipient, even if the information may not itself be dispositive. In essence, one could extrapolate from M_1 and M_2 to conclude that material information is any information about which the recipient would say, “I wish I had known that before I made my decision,” even if it might not have ultimately changed the decision. It is this quality or importance that forms the essence of what we think of as “materiality,” not the imminence or magnitude of the information, which, as we will see, goes to the core of the securities law definition of materiality.

To take a small detour that will illustrate the point: consider the fact that one of us (Dan) observes Jewish dietary laws, which, among other things, prohibit eating certain animals, including pigs. As it turns out, lots of products in the grocery store contain lard or bacon fat, both of which are forbidden. If I were to eat something

9. We are not the first to make this observation. *See e.g.*, LOUIS LOSS, SECURITIES REGULATION 1436 (2d ed. 1961).

10. *See, e.g.*, RESTATEMENT (SECOND) OF TORTS § 525 (AM. L. INST. 1977).

that was not kosher, no physical harm would befall me,¹¹ and if I did it unknowingly, the spiritual consequences would be minimal as well.¹² Applying the logical definitions of M_1 and M_2 above, the list of ingredients is important, perhaps material to me, even though the resulting harm is low. As discussed below, it is not clear that the classic definition of materiality would necessarily lead to the same conclusion.

B. Materiality Under Federal Securities Laws

1. The Definitional Problem

Securities lawyers and investors primarily understand materiality through the lens of federal securities laws. The term first appears in the Securities Act of 1933¹³ where Section 17(a)(2) makes it unlawful in connection with the purchase or sale of securities to “obtain money or property by means of any untrue statement of a material fact or any omission to state a material fact necessary in order to make the statements, in light of the circumstances under which they were made, not misleading.”¹⁴ The term “material” appears not only in numerous other sections of the federal securities laws,¹⁵ but also in rules adopted by the SEC, including, most prominently, Rule 10b-5

11. See, e.g., *Abarbanel on Torah, Leviticus 11:1*, SEFARIA, <http://tinyurl.com/5xc9de7z> [<https://perma.cc/VD28-WD4U>] (last visited May 15, 2024) (“[W]e can see with our own eyes that the nations that eat the flesh of the pig, the creepers, the mouse, and the other impure birds, beasts, and fish are all alive to this day, ‘firm as a mirror of cast metal’ (Job 37:18), and there is none tired or weak among them.”).

12. In the rabbinic literature, a single lapse of this type is considered a mild transgression. See *Mishna Yoma 8:3*, SEFARIA, <http://tinyurl.com/45czv33e> [<https://perma.cc/DE4M-T2JF>] (last visited May 15, 2024) (“If one ate and drank unwittingly within one lapse of awareness . . . he is liable to bring only one sin-offering [a Biblical-era purification sacrifice].”). In the modern era (where we no longer bring sin offerings to the Temple), the rabbinic advice is to perform an act of *tzedakah* (charity) and study the Torah so you don’t inadvertently make the same mistake again. See, e.g., Yisroel Cotlar, *Help! I Ate Something That Wasn’t Kosher!*, CHABAD, <http://tinyurl.com/yc8r2saj> [<https://perma.cc/HA56-KGCT>] (last visited May 2, 2024) (“1) Spend some time reading up [on] the laws of *kashrut* in detail. . . . 2) Inspire another Jew to start keeping kosher. Doing these things not only erases the deed—they actually transform what happened into something positive. . . .”).

13. 15 U.S.C. § 77.

14. Securities Act of 1933 § 17(a), 15 U.S.C. § 77q(a) (2010).

15. See, e.g., Securities and Exchange Act of 1934 § 14(e), 15 U.S.C. § 78n(e) (tender offers); Investment Company Act of 1940 § 34(b), 15 U.S.C. § 80a-34(d) (investment company reports); Investment Advisors Act of 1940 § 203(e)(1), 15 U.S.C. § 80b-7 (investment advisor reports); Securities Act Regulation C, Rule 408(a), 17 C.F.R. § 230.408 (2013) (registration statements); Exchange Act Regulation 12B, Rule 12b-20, 17 C.F.R. § 240.12b-20 (2023) (catch-all materiality requirement); Exchange Act Rule 13e-3(b), 17 C.F.R. § 240.13e-3 (2023) (going private transactions); Exchange Act Rule 14a-9, 17 C.F.R. § 240.14a-9 (2023) (proxy materials); Regulation M-A, Item 1011(b), 17 C.F.R. § 229.1011 (2023) (mergers and acquisitions).

under the Securities Exchange Act of 1934,¹⁶ which employs language similar to Section 17(a)(2) when defining a “manipulative or deceptive device or contrivance.”¹⁷

Despite being threaded through securities laws and rules, no statutory definition of “material” exists, and the various formulations found in the rules retain a certain vagueness about them. The closest thing to a statutory definition may be the definition of material in Rule 405, first adopted by the SEC in 1948: it defined materiality as “matters as to which an average prudent investor ought reasonably to be informed before purchasing the security registered.”¹⁸

Courts called on to define materiality have produced a variety of possible standards,¹⁹ ultimately leading to two seminal cases at the Supreme Court, *TSC Industries, Inc. v. Northway, Inc.*²⁰ and *Basic Inc. v. Levinson*,²¹ which together form the basis for the modern understanding of “materiality.”²² The combined result of these two cases is to define information as material in the context of the purchase or sale of a security if the information alters (or could alter)

16. 17 C.F.R. § 240.10b-5 (2011).

17. See Securities Exchange Act of 1934 §10(b), 15 U.S.C. §78j(b) (2010); 17 C.F.R. §240.10b-5 (2011).

18. Adoption of Amendments to General Rules and Regulations, Release No. 34-4194 (Dec. 17, 1948), *cited in* Business and Financial Disclosure Required by Regulation S-K, Securities Act Release No. 33-10064, Exchange Act Release No. 34-77599, at 36 n.105 (Apr. 13, 1916) [hereinafter Reg. S-K Concept Release]. See also Dale A. Oesterle, *The Overused and Under-Defined Notion of “Material” in Securities Law*, 14 U. PA. J. BUS. L. 167, 170 n.24 (2011).

19. See, e.g., *List v. Fashion Park, Inc.*, 340 F.2d 457, 462 (2d Cir.), *cert. denied*, 382 U.S. 811 (1965) (“The basic test of ‘materiality’ . . . is whether ‘a reasonable man would attach importance (to the fact misrepresented) in determining his choice of action in the transaction in question.’”); *General Time Corp. v. Talley Indus., Inc.*, 403 F.2d 159, 162 (1968) (“The test, we suppose, is whether, taking a properly realistic view, there is a substantial likelihood that the misstatement or omission may have led a stockholder to grant a proxy to the solicitor or to withhold one from the other side, whereas in the absence of this he would have taken a contrary course.”); *Thomas v. Duralite Co., Inc.*, 524 F.2d 577, 584 (1975) (“[T]here is an interplay between materiality and reliance which tends to blur the distinction between them when the factual backdrop changes. Thus, it is not difficult to accept the necessity for a clearly enunciated objective standard when the 10b-5 suit affects a large number of shareholders who may have had no direct or continuing contact with the corporation. But when the scene shifts to a situation where a single purchaser who is well known to the seller actively conceals facts, the distinction between objective materiality and subjective reliance becomes obscured.”).

20. *TSC Indus., Inc. v. Northway, Inc.*, 426 U.S. 438 (1976).

21. *Basic Inc. v. Levinson*, 485 U.S. 224 (1988).

22. Significantly, despite the SEC’s statutory authority to define “materiality” on its own, it adopted the Supreme Court’s definition in 1982. See Reg. S-K Concept Release, *supra* note 18, at 36 (“In 1982, the Commission revised Rule 12b-2, which defines ‘material’ when used to qualify a requirement for the furnishing of information, to adopt the Supreme Court’s definition of materiality.”).

the total mix of information available in the marketplace. The Court put guardrails around both the representativeness of the information's recipient and the nature of the information required: materiality is measured against the expectations of the "reasonable investor;" there must be a "substantial likelihood" that the information would "alter the total mix of information" in the market; and the degree to which the information alters the total mix of information must be "significant." The Court also added one additional caveat: the information has to be important enough to investors that it *could* have affected their decisions, but it does not require investors to show that they *actually* relied on the information.²³

2. *The Time Problem*

Despite these guardrails, the concept of time is still missing from the Supreme Court's pronouncements on materiality: *when*, exactly, does information begin to significantly alter the total mix of information in the marketplace (as opposed to its being insignificant)? *When* does the likelihood that it will significantly alter available information become "substantial" (as opposed to inchoate or vague)? Over just *how long of a time horizon* does the so-called reasonable investor measure?

The case law on materiality says little on this point. To the extent that *TSC* deals with the concept of time in connection with materiality, it operates at a single point in time: "at the time of the proxy statement's issuance."²⁴ Fair enough: the question in *TSC* was whether investors had been given adequate information about a known event that had already occurred, namely the acquisition of TSC by National Industries. *Basic* also involved a merger, but one that had not happened at the time of the alleged misstatements, so it necessarily dealt with a prospective event. Even so, the Court merely waved at the concept of time as a factor in the materiality of the information: it observed that materiality "will depend *at any given time* upon a balancing of both the indicated probability that the event will occur and the anticipated magnitude of the event in light of the totality of

23. The *Basic* Court adopted a version of the efficient market hypothesis, which states that prices in a public market will reflect or impound all available information about a company, and concluded that investors are therefore entitled to rely on the accuracy of pricing signals in the market in lieu of proving individual reliance. *Basic*, 485 U.S. at 247 ("Because most publicly available information is reflected in market price, an investor's reliance on any public material misrepresentations, therefore, may be presumed for purposes of a Rule 10b-5 action."). For a deeper discussion of the Supreme Court's jurisprudence in *TSC*, *Basic*, and their predecessors, see generally Oesterle, *supra* note 18.

24. See *TSC Indus.*, 426 U.S. at 453 n.15.

the [entity's] activity.”²⁵ The Court favorably cited Judge Friendly's observation in *SEC v. Geon Industries*²⁶ that in some circumstances the magnitude of a future event (i.e., the size and scale of an acquisition or merger) can affect *when* news of it becomes material.²⁷ But even here Judge Friendly describes a backward-looking time scale that was limited to a known universe of facts which had already occurred to answer the question of “when should management have known a transaction was more likely than not to occur?”

3. *The Likelihood/Magnitude Problem*

Notably, the Court couched its test in terms of “probability,” implying a degree of mathematical precision that is itself misleading. Read literally, concepts like “substantial likelihood,” “indicated probability,” and “assessing the probability that the event will occur” all suggest that materiality can be defined first by determining the mathematical probability that some event will occur and then multiplying that probability by some magnitude coefficient to reach a mathematically derived result.²⁸ If this kind of mathematical precision is what the Court intended, one would have expected the Court to articulate a bright line threshold number below which something is not material and above which it is. Of course, that is not what the Court actually did.

What *was* the Court suggesting? In describing how to calculate probability, the Court noted that “[g]enerally, in order to assess the probability that the event will occur, a factfinder will need to look to indicia of interest in the transaction at the highest corporate levels.” Notably, this is a subjective, not an empirical or probabilistic, test.²⁹ “Looking at indicia of interest” requires a finder of fact

25. See *Basic*, 485 U.S. at 238 (emphasis added).

26. *SEC v. Geon Indus., Inc.*, 531 F.2d 39 (1976).

27. *Basic*, 485 U.S. at 238 (citing *Geon Indus.*, 531 F.2d at 47–48).

28. This goes beyond a theoretical academic critique because, of course, the law guides corporate understanding and behaviors and forms the basis for advice that lawyers give to their clients. See, e.g., David Aaron, *Updating Corporate and Cybersecurity Practices to Satisfy the SEC's Final Cybersecurity Disclosure Rules: Assessing Materiality of Cybersecurity Incidents*, PERKINS COIE (Sept. 18, 2023), <http://tinyurl.com/3ktw7f> [<https://perma.cc/C2MU-WMX7>] (applying the magnitude/likelihood test for materiality in the context of the SEC's rules regarding cybersecurity risk management, strategy, governance, and incident disclosure).

29. The Court acknowledged as much in *Matrixx Initiatives, Inc. v. Siracusano*, which reaffirmed *Basic* and clarified that the Court was not adopting a bright-line rule for materiality. *Matrixx Initiatives, Inc. v. Siracusano*, 563 U.S. 27 (2011). The Court explained:

Matrixx urges us to adopt a bright-line rule that reports of adverse events associated with a pharmaceutical company's products cannot be material absent a sufficient number of such reports to establish a

(or a company evaluating potential disclosures) to assess, in effect, what management knew about some future event, when they knew it, and how confident they were in what they knew about it. Presumably, as Judge Friendly intuited in *Geon Industries*, the more that management knows about an event, the sooner they know it, and the more confident they are in the quality of the information, the higher the likelihood that that information is material. In the end, therefore, the Court seems to suggest that assessing materiality is an exercise of weighing the evidence for and against materiality on a subjective scale—the same kind of subjective human judgment that drives standards like “beyond a reasonable doubt” and “preponderance of the evidence,” both of which also defy precise mathematical definitions.³⁰

The main point to take away is that the court created a subjective standard but misleadingly couched it in mathematical terms that suggest greater precision than the standard can realistically produce. Despite this inherent imprecision, that mathematical rubric of “likelihood times magnitude equals materiality” sticks with us, and its various iterations remain a key analytical framework for businesses evaluating materiality in connection with forward-looking risk disclosures.³¹ As we will see, however, this rubric suffers from several

statistically significant risk that the product is in fact causing the events. . . . As in *Basic*, Matrixx’s categorical rule would “artificially exclud[e]” information that “would otherwise be considered significant to the trading decision of a reasonable investor.”

Id. at 39–40 (citations omitted).

30. As Justice O’Connor noted in *Victor v. Nebraska*, “[a]lthough [reasonable doubt] is an ancient and honored aspect of our criminal justice system, it defies easy explication.” See *Victor v. Nebraska*, 511 U.S. 1, 5 (1995) (affirming a jury instruction that, in defining “reasonable doubt,” stated that “absolute or mathematical certainty is not required”). “Preponderance of the evidence” is generally defined to mean that the fact at issue “is more probably true than not,” and this standard does not resort to a mathematical weighting of evidence. See 2 C.F.R. § 180.990 (2024); see also MORRIS H. DEGROOT & MARK J. SCHERVISH, *PROBABILITY AND STATISTICS* 4 (3d ed. 2002) (“According to the subjective, or personal, interpretation of probability, the probability that a person assigns to a possible outcome of some process represents her own judgment of the likelihood that the outcome will be obtained. . . . Another person, who may have different beliefs or different information, may assign a different probability to the same outcome. . . . The subjective interpretation provides no ‘objective’ basis for two or more scientists working together to reach a common evaluation of the state of knowledge in some scientific area of common interest.”).

31. See *infra* Section I.C. Practical evidence of this can be gleaned from “thought leadership” articles that are published by prominent law firms that regularly advise large U.S. and multi-national corporations. See, e.g., J. ANTHONY TERRELL, BRACEWELL LLP, *MATERIALITY IN REVIEW* 40–41 (Feb. 12, 2021), <http://tinyurl.com/nhndbpcr> [<https://perma.cc/6UBC-B7CW>]; FREDERICK LEE, BOIES, SCHILLER & FLEXNER LLP, *MATERIALITY AND STATISTICAL SIGNIFICANCE EXPLAINED* 2 (Dec. 16, 2010), <https://tinyurl.com/3nkdckb2> [<https://perma.cc/X28Y-NLQJ>] (“[S]tatistical significance examines some feature of the data and asks the question, ‘how unusual?’ while practical significance looks at the feature and asks, ‘How large?’ . . . Materiality depends

limitations that make it a poor fit for evaluating the impact of long-term existential risks. It also contains an inherent structural defect, namely that there are no “degrees of materiality.” Because it focuses on the probabilistic concept of “likelihood” (despite there not being a bright-line probabilistic threshold) at a fixed moment in time, the rubric’s output is binary: some event *Z* either is likely to occur or not, and therefore *Z* either is a material risk or it is not; there is no in-between state.³² The problem, however, is that not all risks are binary. As discussed below, sometimes they only manifest over time, a variable that is not easily accounted for in the traditional mode of analysis.

4. *The Clash Between Time and Likelihood*

While the clash between time and likelihood may not pose an issue for discrete actions over a short time horizon, a reliance on magnitude and likelihood to measure materiality standards is less useful in their current form for analyzing long-dated existential risks like loss of bio-diversity, melting arctic and Antarctic ice due to global warming, deforestation, water scarcity, increased weather volatility, desertification of fertile acreage, and the like. This is because within the span of typical quarterly or annual time frames most commonly used to assess materiality, the likelihood of such existential events affecting a particular company is usually zero or near zero. This means that the attendant risk is de facto immaterial, irrespective of the magnitude of its impact if (or more likely, when) it occurs.³³

on a combination of statistical and practical significance.”); DAVID A. KATZ & LAURA A. MCINTOSH, WACHTELL, LIPTON, ROSEN & KATZ, CORPORATE GOVERNANCE UPDATE: “MATERIALITY” IN AMERICA AND ABROAD 5 (Apr. 29, 2021), <https://tinyurl.com/mt6evunp> [<https://perma.cc/S4AL-UK8E>] (“The Supreme Court was correct in its judgment that contingent or speculative events should not be accorded the same treatment as nearer-term, more predictable ones.”).

32. *But see* Kohn v. Am. Metal Climax, Inc., 322 F. Supp. 1331 (E.D. Pa. 1971), *modified and appeal dismissed in part*, 458 F.2d 255 (3d Cir. 1972). In *Kohn*, the Court was applying the “buried facts” doctrine to resolve the question of whether material disclosures that were hidden in a mountain of other, arguably immaterial, facts were “adequate,” or whether the company should have called special attention to the material facts. *See id.* at 1362. In that context, the Court implied there were degrees of materiality when it observed that “the more material the facts, the more they should be brought to the attention of the public.” *Id.* We would argue that this was dicta, since the resolution of the buried facts doctrine does not turn on whether the buried facts were material—by definition, the doctrine assumes they are, either individually or in the aggregate—but on whether investors were adequately alerted to them once they were deemed material.

33. *See, e.g.*, SEC Staff Accounting Bulletin No. 99, 64 Fed. Reg. 45150–01 (Aug. 19, 1999) (“[M]agnitude by itself, without regard to the nature of the item and the circumstances in which the judgment has to be made, will not generally be a sufficient basis for a materiality judgment.”).

Imagine that event Z is an existential event that has a knowable impact on Company ABC which could be avoided or mitigated with appropriate advance action. Under classic definitions of materiality, the existence of Z can plausibly be dismissed as “not material” to ABC’s financial results over the next year under either (or both) the likelihood or magnitude tests because it is unlikely to occur in a short enough time horizon, and/or the anticipated impact—if it does materialize—is contingent since ABC could take action to avoid it or reduce its impact.³⁴

The problem for investors—especially long-term investors engaging in a buy-and-hold strategy—is that if ABC does not act in time, by the time Z poses a significant risk or threat, it may be too late to take action to avoid it, or the actions available to ABC may be severely circumscribed versus what would have been available had it acted earlier. It seems inarguable that investors would want to know about such risks and may even be entitled to know about them since they seem to logically fall into the category of important statements (M_1) or omissions (M_2) that would be relevant to their investment decisions. The question of how to measure and represent this conundrum to investors is the subject of Section II.

C. *Variations in the Definition of Materiality*

Before moving on, it is worth noting one of the other challenges to applying materiality, namely a lack of consistency among rubrics. As we noted previously, the concept of materiality is threaded through federal securities laws, regulations, and rules. It also shows up in other accounting and reporting contexts, including standards promulgated by the Financial Accounting Standards Board (“FASB”), the Public Company Accounting Oversight Board (“PCAOB”), the American Institute of Certified Public Accountants (“AICPA”), the International Accounting Standards Board (“IASB”), and others. These standards overlap to some extent, but they diverge in some key areas. A chart comparing the various standards can be found in Table 1 in the Appendix.

For example, several rubrics adhere to the “substantial likelihood” threshold articulated in *TSC* and *Basic*, including the SEC itself, the PCAOB, and the AICPA, while FASB and IASB diverge (using “probable” and “reasonably be expected,” respectively). Meanwhile, all but the IASB agree that the degree of certainty required

34. See, e.g., The Enhancement and Standardization of Climate-Related Disclosures for Investors, 89 Fed. Reg. 21668, 21695 (Mar. 28, 2024) (defining short-term materiality in the context of climate change as risks that “are reasonably likely to manifest” in “the next 12 months”).

is that the information “would” have had an impact; the IASB, by contrast, considers material information that “could” have had an impact. Similarly, there is general agreement about the measuring person: all but the IASB look to a “reasonable” person (though they diverge on whether that person is an “investor,” a “shareholder,” a “user,” or just a “person”).³⁵ The IASB’s measuring person is the “primary user of general-purpose financial statements.” The place where the greatest divergence appears is in determining what the information at issue should be measured against: the “total mix of information” (PCAOB), the reasonable person’s “judgment in the light of surrounding circumstances” (FASB), the user’s “judgment based on the financial statements” (AICPA), the “importance in determining whether to purchase” (SEC), and “decisions made on the basis of . . . financial statements” about an entity (IASB).³⁶

There is not much more clarity when it comes to reporting on sustainability: two major players relevant to U.S. reporting companies are the International Sustainability Standards Board (“ISSB”), which has merged with the Sustainability Accounting Standards Board and the Taskforce on Climate-based Financial Disclosure to produce a new set of reporting standards, the IFRS S1 and S2,³⁷ and the SEC itself, which recently adopted final climate reporting standards. Not surprisingly, these standards diverge in key respects.³⁸

The ISSB, which is a corporate sibling of the IASB, follows the IASB’s definition of materiality: whether the information at issue *could* reasonably be expected to influence decisions made by the primary user of general-purpose financial reports, including financial statements and sustainability-related financial disclosures, and which provide information about a specific reporting entity.

Meanwhile, the SEC’s new climate disclosure rules apply a version of the *TSC* and *Basic* definition: “a substantial likelihood that a reasonable investor would consider it important in determining whether to buy or sell securities or how to vote.”³⁹ In practice, the SEC actually endorses various other analytical approaches as well: for example, the SEC incorporates by reference the materiality standard in its guidance to registrants in connection with the Management

35. See Table 1, *infra* Appendix.

36. See Table 1, *infra* Appendix.

37. These standards will be applicable starting in the 2024 reporting year but they are voluntary metrics only. See IFRS FOUND., PROJECT SUMMARY: IFRS SUSTAINABILITY DISCLOSURE STANDARDS 2 (2023), <https://tinyurl.com/e9tfxabr> [<https://perma.cc/63JN-UD79>].

38. See Table 2, *infra* Appendix.

39. The Enhancement and Standardization of Climate-Related Disclosures for Investors, 89 Fed. Reg. at 21696.

Disclosure and Analysis (“MD&A”) section of Form 10-K.⁴⁰ This qualifies the “reasonable likelihood” standard with respect to future events that may be material, by requiring management to “make an objective evaluation, based on materiality, including where the fruition of future events is unknown.”⁴¹ The SEC also emphasizes that the materiality determination “is fact specific” and “one that requires both quantitative and qualitative considerations.”⁴² The final rule also adopts a one percent threshold for disclosing the financial impacts of certain climate risks (specifically, severe weather events and other natural conditions), establishing a mathematical threshold for materiality for the first time.⁴³

In contrast to the SEC’s focus on inward-looking risks (that is, identifying external climate risks that would render the company’s financial statements or disclosures materially inaccurate), the concept of “double materiality” evaluates a company’s outward impact on the environment. Under a double materiality standard, “climate-related information should be reported if it is necessary for an understanding of the external impacts of the company,” which is “typically most of interest to citizens, consumers, employees, business partners, communities and civil society organizations” as well as investors seeking “to better understand and measure the climate impacts of their investment portfolios.”⁴⁴

The SEC climate disclosure rule does import a modest temporal element into these materiality determinations by requiring management to evaluate risks that are “reasonably likely to manifest” within the next 12 months, and separately evaluate risks that are likely to manifest beyond the next 12 months.⁴⁵ Despite bringing a measure of clarity to where the line is between the short now and the long now, this is not entirely new ground: as noted above, the short-term/

40. *Id.* at 21695 (citing Commission Guidance Regarding Management’s Discussion and Analysis of Financial Condition and Results of Operation, Securities Act Release No. 33-8350, 68 Fed. Reg. 75056 (Dec. 29, 2003)).

41. *Id.* at 21696 n.383 (“According to this guidance, the reasonably likely standard ‘is not intended to, nor does it require, registrants to affirm the non-existence or non-occurrence of a material future event.’”).

42. *Id.*

43. *Id.* at 21675.

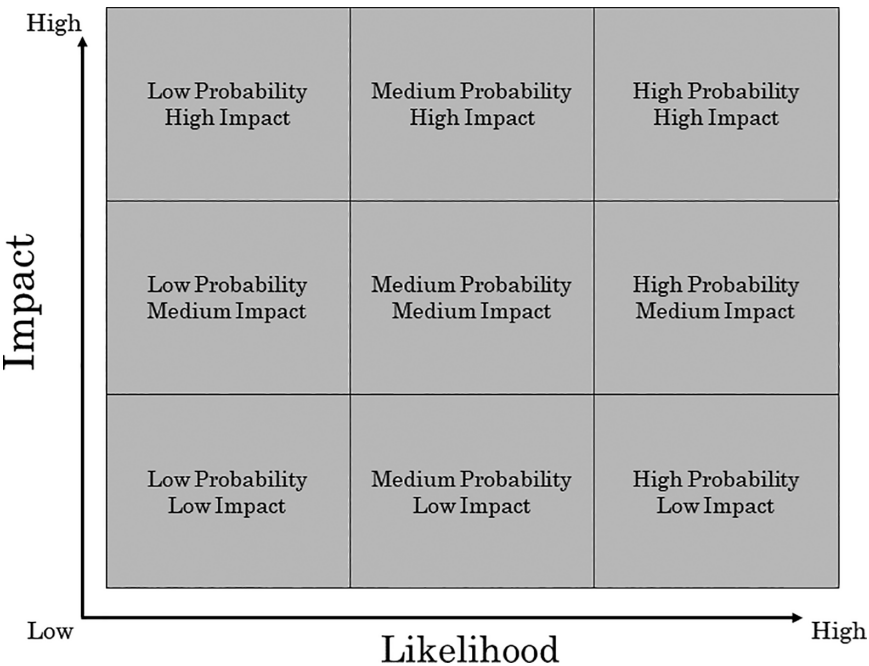
44. Guidelines on Non-Financial Reporting: Supplement on Reporting Climate-Related Information, 2019 O.J. (C 209/1). *See also* Henry Engler, “Double Materiality”: New Legal Concept Likely to Play in Debate Over SEC’s Climate Plan, THOMSON REUTERS (Apr. 12, 2022), <http://tinyurl.com/2p8exxuv> [<https://perma.cc/C4CC-EUMR>] (“The concept of *double materiality* describes how corporate information can be important both for its implications about a firm’s financial value, and about a firm’s impact on the world at large, particularly with regard to climate change and other environmental impacts.”).

45. The Enhancement and Standardization of Climate-Related Disclosures for Investors, 89 Fed. Reg. 21668, 21695 (Mar. 28, 2024).

long-term calculation is based on the existing approach to a registrant’s MD&A disclosure. Moreover, the rule still leaves unanswered the question: when does a “potential future event” become a “material” risk for a company? One is also left wondering where that line should be drawn: is there an agreed-upon probability or an agreed-upon magnitude that triggers materiality? The answer—perhaps unsurprisingly—is no.

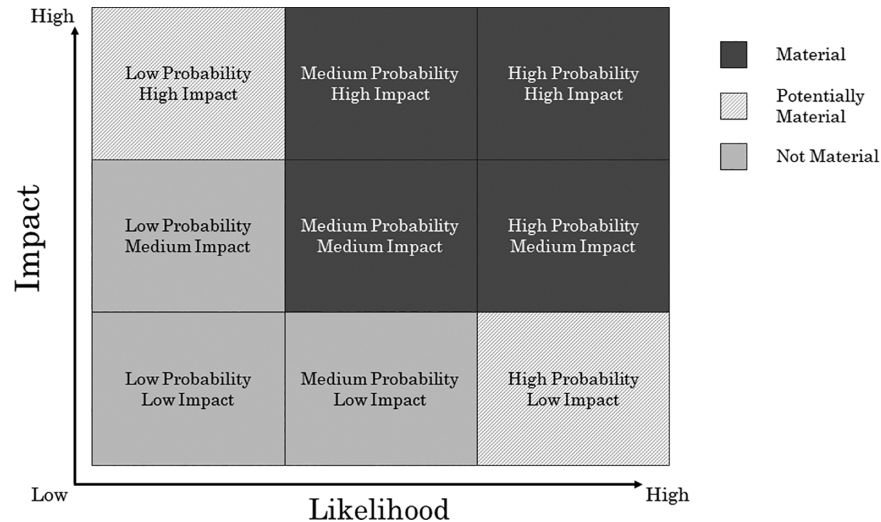
Materiality and traditional models of risk assessment are based on the same substrate: evaluating the likelihood of occurrence on one axis and the magnitude of harm on the other. If we assume three states of likelihood—low, moderate, and high—and we assume three degrees of magnitude—low, medium, and high—we can plot possible risk assessment states into a grid with nine squares:

FIGURE 1: TRADITIONAL RISK ASSESSMENT (PROBABILITY/ MAGNITUDE) GRID



Based on the traditional probability/magnitude test adopted by the Supreme Court and SEC, one can roughly classify categories of risks as either material or not material—low probability/low impact risks likely would not be material, while high probability/high impact risks likely would be material. The resulting classification would look something like this:

FIGURE 2: MATERIALITY GRID



Given the Supreme Court’s aversion to establishing a bright-line rule, this is as close as we can get to precision. Depending on management’s judgment and intuition, there could be two different answers for whether something in the striped boxes above would be considered “material” or not.

D. Biases and Risk Mapping: Accounting for the Human Factor

The difficulty with applying the risk framework described above becomes evident when one begins to map specific risks onto the grid. For example, Item 303 of Regulation S-K requires companies to assess risks as part of the MD&A section of its annual Form 10-K filing, but only to the extent that management believes they are “reasonably likely to cause reported *financial* information not to be necessarily indicative of future operating results or of future *financial* condition.”⁴⁶ In the context of environmental risks that may not yet have a quantifiable financial impact other than “not zero,” this presents a double challenge: first, environmental risk is only material if it creates a significant financial impact over a relatively limited future period, and only if that risk is reasonably probable. Second, it still

46. 17 C.F.R. § 229.303(a) (2023) (emphasis added). This is the same rubric adopted by the SEC in the climate disclosure rules. The rules add a new Part 1500 to Regulation S-K, which requires registrants to evaluate whether any climate-related risks are reasonably likely to have a material impact on business strategy, results of operations, or financial condition. See *The Enhancement and Standardization of Climate-Related Disclosures for Investors*, 89 Fed. Reg. at 21696.

resolves down to a subjective binary (but still subjective) conclusion: material or not. But as former SEC Commissioner Allison Herren-Lee has noted:

[I]n making these determinations, management frequently sees things differently from investors. . . . Management may view matters with an enthusiasm that reflects a belief in the nature and direction of their business. Developments that investors may see as negative and in need of disclosure may be viewed by management as a temporary aberration or even a positive development.⁴⁷

A subjective evaluation may also impound various cognitive biases that are endemic to how humans understand and interpret large-scale and long-term risks. A full list of cognitive biases that may affect judgment exceeds this Article's scope, but the headline is that humans, as a species, struggle to judge objectively. A handful of potential biases should illustrate the problem. For example, long-term judgments can be affected by anchoring bias (also known as "focalism"), which is the tendency to anchor or rely on limited sets of information that are most familiar.⁴⁸ This may take the form of a "conservatism bias," in which the decision-maker fails to update his or her beliefs when presented with newer information that challenges existing information or knowledge.⁴⁹ Judgment can also be affected by a so-called "normalcy bias," in which a decision-maker

47. Allison Herren Lee, *Living in a Material World: Myths and Misconceptions About "Materiality"*, U.S. SEC. & EXCH. COMM'N (May 24, 2021), <https://tinyurl.com/2p8bv25j> [<https://perma.cc/3CWP-K3KZ>] (citations omitted).

48. Focalism is related to the concepts of salience and accessibility, which respectively refer to the degree of importance one attaches to a piece of information that could trigger action, and the ease of availability of additional information with which to assess the salience of information and take action. *See, e.g.*, Timothy Wilson et al., *Focalism: A Source of Durability Bias in Affective Forecasting*, 78 J. PERSONALITY & SOC. PSYCH. 821 (2000). As we will see in Section II, focalism may cause decision-makers to discount information that would otherwise be salient because the additional information necessary to evaluate its salience is not easily accessible. *See* E. Tory Higgins, *Knowledge Activation: Accessibility, Applicability, and Salience*, in *SOCIAL PSYCHOLOGY: HANDBOOK OF BASIC PRINCIPLES* 133 (E. Tory Higgins & Arie W. Kruglanski eds., 1996).

49. *See, e.g.*, Ulrike Hahn & Adam Harris, *What Does It Mean to be Biased: Motivated Reasoning and Rationality*, 61 PSYCH. LEARNING & MOTIVATION 41 (2014); *see also* Adam Corner et al., *Conservatism in Belief Revision and Participant Skepticism*, 32 PROC. ANN. CONF. COGNITIVE SCI. SOC'Y 1625, 1625 (Stellan Ohlsson & Richard Catrambone eds., 2010) ("[P]eople are conservative relative to the predictions of Bayes' Theorem. The provision of new evidence does not seem to have the impact on people's existing beliefs that Bayes' Theorem predicts it should.") (citations omitted).

discounts the need to plan for or react to a risk or challenge to the status quo.⁵⁰

Judgments can also be affected by “present-biased preferences,” which favor more immediate payoffs over later payoffs.⁵¹ With this kind of bias, the time frame under consideration affects decision-making: decision-makers who are told to consider long-term goals will tend to choose immediate actions that have a lower payoff in the short term but maximize the long-term payoff, while those who are asked to consider only short-term goals will choose actions that maximize short-term results even if those actions negatively impact long-term goals. Finally (for illustrative purposes), there is the “plan continuation bias,” in which a decisionmaker ignores evidence that a plan of action is no longer appropriate due to changes in the external environment. Traders sometimes refer to this as “refusing to sell your losers” to describe investors who think that if they can hold on longer, the market will surely turn around.

Given the long-dated nature of climate risks, we believe that materiality assessments should acknowledge and, to the extent possible, incorporate defenses against these and other cognitive biases. As described in Section II, one of the mechanisms to achieve this hinges on understanding how business decisions are typically made. We also discuss how the impact of time can be captured and brought into materiality analyses in order to deliver more robust, informative results.

II. DECISION MAKING, TIME, AND STRATEGY

A. What Are “Decisions,” and How Are They Made?

At the risk of stating a truism, let us define a “decision” as a determination or judgment of the best course of action after consideration of inputs, relevance, and the probabilities of various possible outcomes. The process of reaching a decision can be broken down

50. See, e.g., Atsuo Murata et al., *Influence of Cognitive Biases in Distorting Decision Making and Leading to Critical Unfavorable Incidents*, 1 SAFETY 45, 48 (2015) (“Normalcy biases represent our propensity to regard minor abnormalities as normal. . . . Normalcy bias is in fact a coping mechanism we adopt while attempting to register and deal with stressful events or impending disasters. Because fears change, one tends to resist them, and in turn, the brain tries to simulate a normal environment. . . . However, risk can stem from this bias, as we usually become accustomed to normal situations or states and thereby tend to overestimate optimistically that the situations surrounding us will continue to be normal.”).

51. See, e.g., Ted O’Donoghue & Matthew Rabin, *Doing It Now or Later*, 89 AM. ECON. REV. 103, 106 (1999) (“People tend to exhibit a specific type of time-inconsistent preferences that we call present-biased preferences: When considering trade-offs between two future moments, present-biased preferences give stronger relative weight to the earlier moment as it gets closer.”).

into analytical units, each of which can be optimized in order to (i) identify the best possible outcomes and (ii) most thoroughly analyze each outcome to determine its efficacy against some specific goal (such as making the most profitable product, being first to market, making the cheapest or most ubiquitous product, making the most sustainable product, etc.). We assume each decision leads to some measurable action needed to implement that decision.

The efficacy of a decision can be evaluated by comparing the status quo prior to the decision (at time $T=0$) to some measurable outcome after the decision (at $T=n$, where n represents some measured time after $T=0$). This process can be repeated multiple times at varying intervals (i.e., at $T=n$, $T=n+1$, $T=n+2$, etc.), and the outcomes at each interval can be classified as positive (contributing to achieving the desired goal) or negative (not contributing to achieving the desired goal). A single decision can be positive at some intervals and negative at others. The operative variable, in that case, is time.

Because of the time variable, the success or failure of a decision may be difficult to determine at any single interval; some decisions can only be evaluated by comparing or averaging a succession of outcomes. For example, consider the decision (at $T=0$) to invest in an untested but promising technology. At $T=1$, there is a successful alpha test of the product that proves the conceptual design, but at $T=2$, beta testing reveals several substantial flaws that will inflate costs and delay launch while they are fixed. At $T=3$, the product is released, and early reviews are positive, but sales are slow because the market is still adapting to it. At $T=4$, the market has adapted to the new technology, and sales are growing at a steady and sustainable pace. If an observer measured the quality of the decision at $T=1$ or $T=4$, the observer would likely classify the investment decision as positive; at $T=2$, it would likely be negative; and at $T=3$, the decision could be classified as a mix of positive and negative depending on the outlook of the observer.

The problem, of course, is that the decision has to be made and committed to at $T=0$ before the results shown at $T=1$ through $T=4$ are known. To minimize the risk of making a bad decision, businesses have developed a range of mechanisms for identifying decision data points, analyzing them, and making decisions accordingly. At one extreme are “gut” decisions, in which the evaluation of information is as much art as science. At the other extreme are highly data-driven decisions that seek as much information as possible to squelch the art and rely wholly on science.

One well-publicized example of an industry that went from one extreme to the other is Major League Baseball. For decades, decisions

in baseball were made based on a mix of intuition and experience. Acquiring talented players is a zero-sum game that carries decisional risks: discovering new talent allows teams to lock in future stars when they are young and when they are cheap to acquire, but the failure rate is commensurately higher because prospects are unknown quantities. Team owners employed scouts who could identify young prospects based on having seen hundreds or thousands of other prospects over the course of years and having a sense of what combination of qualities would make a successful player. As described by Louis Menand, “[t]he scout thinks that you have to see a player to know if he has what it takes.”⁵² Bill James, a baseball analyst, came at baseball from the other end of the spectrum through data. James believed there was a widespread misunderstanding about how baseball was played. By looking at inputs different from those of typical baseball statisticians, he showed that the past performance and potential future performance of a player could be more accurately calculated and predicted. The system that he pioneered—sabermetrics—improved decisional efficacy about which baseball players to hire and fire, which James believed would, in turn, lead to more wins and fewer losses. Sabermetrics’ impact on the game of baseball cannot be overstated: it revolutionized the way players are chosen and deployed and how baseball teams are organized and run today.⁵³ Even so, sabermetrics is not a “strategy” per se; it is just a tool for managing risk—the ultimate decisions (which player to acquire, how much to pay them, and when and in what situations to play them, to name a few) may be informed by data, but they are still human judgments, and the responsibility for those judgments still rests in human hands.⁵⁴ Put another way, even with the most complex data, intuition still has a role.

52. Louis Menand, *What Baseball Teaches Us About Measuring Talent*, NEW YORKER (Apr. 1, 2019), <http://tinyurl.com/4kzc63fs> [<https://perma.cc/8A5C-JZST>].

53. See generally MICHAEL LEWIS, *MONEYBALL: THE ART OF WINNING AN UNFAIR GAME* (2004); Joshua Mizels et al., *Current State of Data and Analytics Research in Baseball*, 15 CURRENT REV. MUSCULOSKELETAL MED. 283 (2022).

54. Contrary to the meta-narrative of Michael Lewis’s book, *Moneyball*, which tried to depict the triumph of data over intuition, much of what a baseball scout actually does is to evaluate prospects on a range of skills—things like speed, accuracy, consistency, power, and range—and develop a single number (overall future potential, or OFP). See CHRISTOPHER J. PHILLIPS, *SCOUTING AND SCORING: HOW WE KNOW WHAT WE KNOW ABOUT BASEBALL 3* (2019). Meanwhile, the hard statistics that sabermetrics relies upon—such as number of strikeouts vs. base-on-balls a pitcher throws, player errors, and ultimately a player’s on base percentage—rely fundamentally on human judgments by umpires and official scorers who decide in the moment whether a pitch was a ball or a strike, or whether a hit was fair or foul, and so on. See *id.*

B. Error Avoidance and the Development of Decision Models

Any time human intuition is injected into a process, human fallibility is unavoidably introduced into the mix as well. In any business (sports or otherwise), errors are costly. Whether financially, reputationally, or from a resource standpoint, businesses spend a lot of time and effort and institute a lot of processes and procedures in an attempt to reduce errors.

Why do errors happen? Poet Alexander Pope would say, “to err is human,”⁵⁵ but we can do better. An analysis of the literature around errors and decisions reveals that there are generally two types of errors: unpredictable and predictable.⁵⁶ *Unpredictable* errors are random errors that occur by chance. Since the potential always exists for some unforeseen variability or externality in life that leads to random error, it would be a fool’s errand to attempt to solve the existentially volatile nature of the universe. The best we can do is plan for the worst and hope for the best. By contrast, *predictable* or systemic errors are, in one way or another, ultimately the fault of humans. That is bad news on one level because it means we have no one but ourselves to blame, but on another level, it is good news because it means that these types of errors can be avoided entirely or at least addressed, mitigated, and engineered to minimize the human factor. This is why businesses spend all that effort and money on implementing processes and procedures.⁵⁷

Important to our purpose is the concept of “forced” and “unforced” errors. Typically, an unpredictable error is forced—extrinsic circumstances dictate the timing and extent of an error, and there is little possibility of avoiding the error; at best, adequate preparation allows one to delay the onset of these kinds of events and mitigate the downstream damage. Usually, these types of errors are managed by strict adherence to policies and procedures—think cockpit checklists or surgical protocols—and by rigorous study and after-action reviews of past errors in order to glean lessons to prevent them from happening again. Predictable errors are typically unforced, often as a result of a failure to plan properly or completely despite clear clues or warnings as to what might transpire. It is this latter group on which we focus when evaluating the materiality of climate risks and potential remediations that will mitigate or avoid

55. ALEXANDER POPE, AN ESSAY ON CRITICISM 26 (3d ed. 1713) (“To Err is Human[]; to Forgive, Divine.”).

56. See, e.g., JAMES REASON, HUMAN ERROR 4–10 (1990); see generally Dietrich Dörner & Harald Schaub, *Errors in Planning and Decision Making and the Nature of Human Information Processing*, 43 APPLIED PSYCH. 433 (1994).

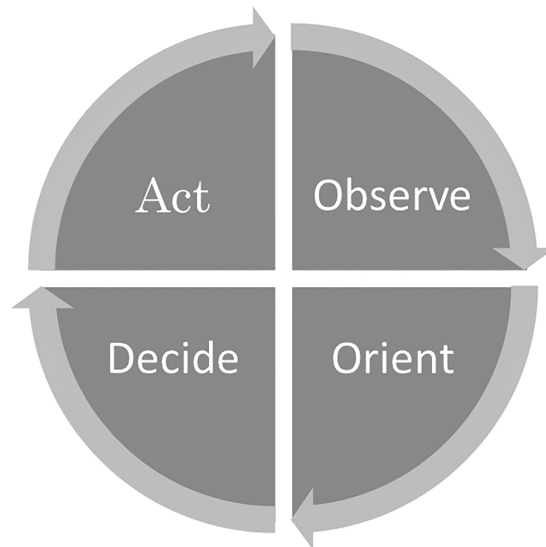
57. See generally Dörner & Schaub, *supra* note 56.

future harm. With that in mind, two key models for how decisions are made and errors avoided require closer examination.

C. Decision Analysis and the Impact of Time

An early effort to formalize the decision-making process to minimize or eliminate costly errors originated with the U.S. military. In the 1960s, Colonel John Boyd developed the “OODA loop,” which is an acronym for “observe, orient, decide, and act.”⁵⁸ An OODA loop is a model for breaking decisions into addressable component parts that can be analyzed and optimized and for training decision-makers to anticipate and avoid unforced errors.

FIGURE 3: BOYD’S OODA LOOP⁵⁹



Boyd originally conceived the OODA loop during his time as a successful fighter pilot during the Vietnam War. He realized his combat victories were less about who had overwhelming firepower and more about the ability to process information during the engagement. Boyd observed that processing speed was a key advantage: the pilot who could cycle through an OODA loop more rapidly than his opponent could act while his opponent was still orienting or deciding, thereby forcing the opponent back to the beginning of a new OODA

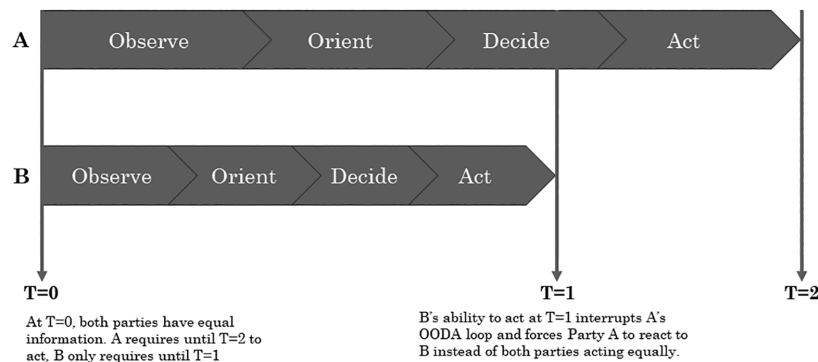
58. See generally JOHN BOYD, PATTERNS OF CONFLICT (1986), <http://tinyurl.com/4fayd4zj> [<https://perma.cc/ZUV3-BTTU>].

59. *The OODA Loop Explained: The Real Story About the Ultimate Model for Decision-Making in Competitive Environments*, OODA Loop, <https://tinyurl.com/ms49233u> [<https://perma.cc/62MS-AQLZ>] (last visited Mar. 9, 2024).

loop in order to observe and process the new information created by the faster pilot's action. Meanwhile, having acted before his opponent, the faster pilot could start a new OODA loop cycle of his own, allowing him to press his advantage further.⁶⁰ Boyd generalized from this observation that the faster someone can determine probability, relevance, and materiality, the faster that person can make a good decision.⁶¹

FIGURE 4: SPEED OF CYCLING THROUGH AN OODA LOOP

A decision maker that can process this cycle quickly, and more importantly more rapidly than an opponent, can get inside the opponent's decision cycle and gain relative advantage in the environment or situation.



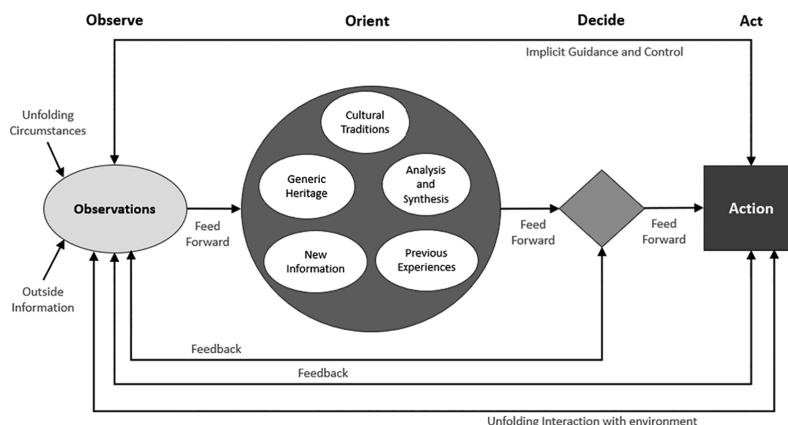
Boyd's OODA loop has been adapted to modern corporate decision-making theory⁶² as a useful model for the way many decision-makers evaluate choices and determine a course of action. Boyd's observation about speed in OODA loops also applies: if a company can move through a decision cycle faster than competitors, it can gain an advantage in the market, either because it can innovate faster or because it can leverage its advantage to generate more revenue and lower its costs.

60. See Fig. 3, *supra*.

61. Chet Richards, *Boyd's OODA Loop*, 5 NECESSE 142, 157 (2020) ("The ability to operate at a faster tempo or rhythm than an adversary enables one to fold adversary back inside himself so that he can neither appreciate nor keep-up with what's going on. He will become disoriented or confused.").

62. See, e.g., CHET RICHARDS, CERTAIN TO WIN: THE STRATEGY OF JOHN BOYD, APPLIED TO BUSINESS 26–28 (2004); see also NEIL PERKIN & PETER ABRAHAM, BUILDING THE AGILE BUSINESS THROUGH DIGITAL TRANSFORMATION 57–61 (2017).

FIGURE 5: JOHN BOYD'S OODA LOOP ADAPTED FOR COMMERCIAL ENTERPRISES⁶³



OODA loops inherently stress that “faster is better.” The fact that you are faster than your opponent—even by half a second—traps them constantly in a reactive mode, which you then can exploit. In many situations, this stands a company in good stead: in a corporate competition where speed matters (e.g., being first to market), the ability to get through your company’s OODA loop faster than your competitor can get through theirs confers an advantage.

Interestingly, fast loops and materiality seem to go hand-in-hand; events or occurrences that may slow a company down put it at a disadvantage vis-à-vis its competitors and will, therefore, lead to materially negative outcomes. The short measuring cycles that public companies are typically subjected to—daily stock price movements and quarterly and annual reporting requirements—reinforce the equation of materiality with speed and brevity.

But what happens when one has plenty of time because an opponent operates at a different, much slower speed? It can become very complicated to discern when one portion of an OODA loop ends and another begins. In that scenario, how does one know when it is the right time to move from one phase of the OODA loop to another? How much orientation is needed? How much analysis? When is a decision required?

Fast loops are easy because time forces movement. Consider the analogy of boarding a moving train: you must see (observe) that the train is moving, evaluate (orient to) the speed of the train relative to

63. Adapted by the authors from JOHN BOYD, *THE ESSENCE OF WINNING AND LOSING 3* (Chet Richards & Chuck Spinney eds., 1996), <https://tinyurl.com/w92f32pd> [<https://perma.cc/3PQ4-HZHJ>]. The appearance of U.S. Department of Defense (DoD) visual information does not imply or constitute DoD endorsement.

your position, figure out whether you can make it, determine (decide) that you want to jump on the train, and then actually jump (act). There arrives a point where you have to act, or the moment will pass and you will thereafter lose the benefit of your observation, orientation, and decision. As they say, she who hesitates is lost.

Now, imagine instead that the train is just sitting there. You have arrived at the train station an hour before departure, and you can board the train at any time. If you board the train too early, you will miss the opportunity to dine in the train station food court, shop for souvenirs, or just enjoy the beautiful weather outside. If you board too late, you might not get the seat you really want, and there might not be room for your bags near where you are sitting. When do you board the train? This case complicates the OODA loop because your opponent is also not a single player; it is all of the other passengers waiting to board the train as well. As a result, it is never clear to whom or to what you should be reacting, and there is no clear moment where you are penalized for lingering too long in one of the phases. Put another way, at any given moment, there is nothing explicitly forcing you to move to the next phase in order to preserve your advantage. The only constraint is the need to act “before it is too late,” but there is no clear metric to determine when is optimal, only when it has actually grown too late.

Slow risks present a challenge for decision-makers. What is a corporate leader to do when opponents’ actions are not easily identifiable or quantifiable within a particular time scale? Can a leader safely ignore these opponents and the threat that they represent?

We would argue that the answer is *no*. As the stationary train example illustrates, risk ultimately has a time dimension, and therefore, decision-makers de facto assume increased risks if they act either too soon or too late. Deciding on a course of action before gathering adequate information about the problem and weighing potential solutions and outcomes can be as risky as waiting too long and acting too late and, therefore, being forced into limited or suboptimal decisions. Underestimation of the problem can lead to consequences as bad as overestimation. There is a sweet spot of decision-making where adequate information has been gathered, and enough flexibility remains to enact solutions with the highest chances of success and the greatest potential for positive outcomes.

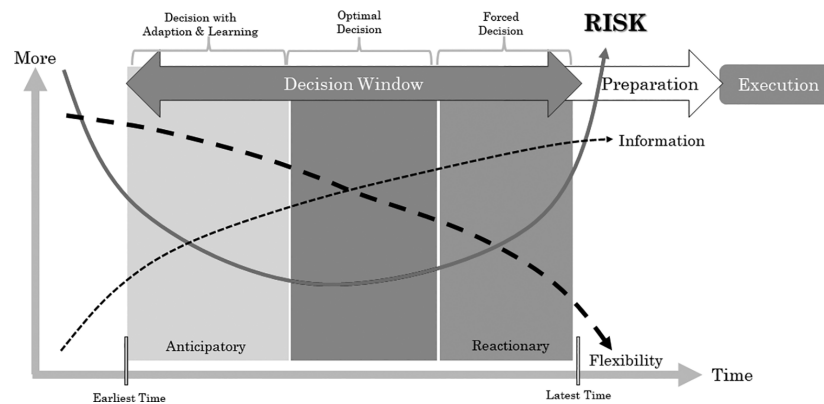
The figure below, adapted from materials created by the U.S. Military Joint Chiefs of Staff to model risk and decision timelines (the “JCS Model”),⁶⁴ illustrates how this can be mapped. Time is

64. DEPLOYABLE TRAINING DIV. JOINT STAFF J7, ASSESSMENT AND RISK 14 (3d ed. 2020), <https://tinyurl.com/4kpjfb5x> [<https://perma.cc/V6C9-5ML3>]. The appearance

plotted along the X-axis, while the Y-axis captures the relative degree (less to more) of three elements: risk, information availability, and decisional flexibility. A decision can be made at any point in time.

FIGURE 6: JOINT CHIEFS OF STAFF DECISION MODEL⁶⁵

Materiality Risk & Decision Timeline



At the earliest measuring point, there is typically low information and a high degree of flexibility: when nothing is fixed, anything is possible. The combination of high flexibility and low information poses a risk, however, because it is easy to commit too early to the wrong decision and thereby foreclose better opportunities. Let's go back to the stationary train example: if it turns out that the train will carry relatively few passengers that day, boarding too early forecloses other opportunities to shop, eat, or enjoy the fresh air, but does not enhance your benefit commensurately. After all, it turns out you would have been able to select a seat of choice at any time, right up to departure. If you had waited to get more information about ticket sales, you could have had lunch and a comfortable seat.

As time passes, more information becomes available, which reduces some of the risk of acting too early. However, the passage of time also tends to reduce your decisional flexibility. Suppose there are four seats you really like on the train. While you watch to see how many people are on the platform waiting to board, someone comes and sits in one of them, so now you only have three to choose from. Even though you did not do anything, time has limited your options. That is a risk.

of U.S. Department of Defense (DoD) visual information does not imply or constitute DoD endorsement.

65. *Id.*

At some point, you will have as much information as you want or need to make a decision, but the passage of time will have compromised your ability to make the optimal decision. As the train's departure time approaches, more and more people are milling around on the platform, and you realize that you had better find a seat. But by this time, only the least favorite of your four preferred seats is available. On top of that, there is an additional significant risk: while you might still end up in one of your original preferred seats, you no longer have any margin for error—if someone gets to the seat before you do, you will have no preferred alternatives left. Time has, in effect, eliminated any decisional flexibility you had and simultaneously increased your risk.

As illustrated in Figure 6 above, there is a theoretically optimal time to act: risk is lowest when decision-makers have some, but not necessarily all, available information and when they have some, but not necessarily all, decisional flexibility.

D. Applying the New Time-Risk Model

In the same way that corporate decision-makers benefitted from understanding decision-making through the lens of the OODA loop, we propose that when it comes to assessing long-tail materiality (that is, the materiality of long-dated risks and threats), anyone who has a role in assessing materiality can similarly benefit from the more sophisticated JCS Model of decision making to get a deeper understanding of how corporate decisions are made, including the critical role that time plays in creating risk.

1. Climate: The Ultimate Slow Opponent

Properly integrating time into decision-making at the corporate level is not a theoretical concern. Take the example of climate change: at what moment does climate risk become material? The answer is not “never,” but even the most experienced climate scientists would be hard-pressed to give a more precise answer. What is known is a set of risks and a range of time over which they will present themselves. Over the next 20 to 30 years, climate change and other environmental concerns will pose profound challenges to traditional ways of doing business—such as increased risks of disruption due to severe weather events,⁶⁶ water scarcity and desertification of previously productive

66. See, e.g., Jessica Whitt & Scott Gordon, *Gloomy Forecast: The Economic Costs of Extreme Weather*, BARCLAYS (Mar. 2, 2023), <https://tinyurl.com/ykrd935t> [<https://perma.cc/LC9B-77NF>].

acreage,⁶⁷ changes in crop yields,⁶⁸ loss of biodiversity,⁶⁹ ocean-level increases that threaten coastal development and infrastructure,⁷⁰ increased climate-driven migration,⁷¹ and fundamental shifts in consumer and investor attitudes toward environmental and climate risk on the one hand and corporate resiliency on the other.⁷² Addressing these challenges will offer lucrative investment opportunities for businesses transitioning to new sustainable ways of doing business.⁷³ The amount of investments currently being funneled toward this green transition is staggering: over \$8 trillion of professionally managed funds—1 out of every 8 professionally managed dollars—was invested during 2022 in funds and investment vehicles with specific sustainability and environmental, social, and governance (“ESG”) criteria.⁷⁴ Climate change and carbon usage were among the biggest concerns among all money managers and institutional investors when making investment decisions.⁷⁵ Meanwhile, estimates have put the size of the total market for green investments at upwards of \$50 trillion by 2030, with annual investments of up to \$3 trillion as

67. See, e.g., Christopher Flavelle & Mira Rojanasakul, *Five Takeaways from Our Investigation into America's Groundwater Crisis*, N.Y. TIMES (Aug. 29, 2023), <http://tinyurl.com/5yw4ce2a> [<https://perma.cc/DD8X-LH57>].

68. See, e.g., *Climate Change Impacts on Agriculture and Food Supply*, ENV'T PROT. AGENCY (Nov. 16, 2023), <http://tinyurl.com/msdu9we5> [<https://perma.cc/47CP-D7DT>].

69. See, e.g., *Biodiversity – Our Strongest Natural Defense Against Climate Change*, UNITED NATIONS, <http://tinyurl.com/2xrydvj5> [<https://perma.cc/G5A2-TEQ4>] (last visited May 20, 2024) (“[C]limate change is playing an increasingly important role in the decline of biodiversity.”).

70. See, e.g., *Climate Change Indicators: Sea Level*, ENV'T PROT. AGENCY (Nov. 1, 2023), <http://tinyurl.com/3ntycpah> [<https://perma.cc/4J6B-S2S9>] (“Rising sea level inundates low-lying wetlands and dry land, erodes shorelines, contributes to coastal flooding, and increases the flow of salt water into estuaries and nearby groundwater aquifers. Higher sea level also makes coastal infrastructure more vulnerable to damage from storms.”).

71. See, e.g., Mia Prange, *Climate Change is Fueling Migration. Do Climate Migrants Have Legal Protections?*, COUNCIL ON FOREIGN RELS. (Dec. 19, 2022, 11:11 AM), <https://tinyurl.com/yktjy9sd> [<https://perma.cc/AZ9J-C7RR>] (“Climate migration occurs when people leave their homes due to extreme weather events, including floods, heat waves, droughts, and wildfires, as well as slower-moving climate challenges such as rising seas and intensifying water stress. This form of migration is increasing because the world has not been able to reduce greenhouse gas emissions and halt global average temperature rise, which leads to more climate disasters.”).

72. See, e.g., Alexander Gelfand, *The ESG Generation Gap: Millennials and Boomers Split on their Investing Goals*, STANFORD GRADUATE SCH. BUS. (Nov. 10, 2022), <https://tinyurl.com/5bz92pha>, [<https://perma.cc/8EMX-JH2M>].

73. See *World Investment Report 2023*, U.N. CONF. ON TRADE & DEV. (2023), <https://tinyurl.com/2s4kahcm>, [<https://perma.cc/3VJL-Q3BG>].

74. U.S. SUSTAINABLE INV. F., 2022 REPORT ON US SUSTAINABLE INVESTING TRENDS 2 (2022), <https://tinyurl.com/ywy9x4v8>, [<https://perma.cc/6K5D-TNND>].

75. See *id.*

a result of energy transition projects in Europe and the Inflation Reduction Act in the United States.⁷⁶

Despite the growth of sustainable investment as a percentage of all investments, there remains significant confusion among companies and investors alike as to how to quantify and report on the risks associated with climate change precisely because there is not just one threat; there are many. Furthermore, because there is not a singular event horizon as there was, for example, with the Y2K computer bug, the opportunity to remediate, mitigate, and avoid is ongoing. When it comes to climate, there is no specific thing pushing us through our OODA loop. Moreover, by the time there is some discrete event that requires immediate action to remediate, avoid, or mitigate risk, the available options for remediation may be severely constricted—avoiding the risk may no longer be an option even though it would have been an option if the company had acted sooner. As the saying goes, the best time to plant a tree is 30 years ago.

2. *Shortcomings of Existing Disclosure Regimes*

It is tempting to believe that all is well on the sustainability front and that we have time before we have to make any critical decisions. Many companies are sourcing renewable materials for manufacturing products, powering operations with low-carbon or carbon-free energy, and/or creating products with a lower carbon footprint,⁷⁷ and 96 percent of the world's top companies (the Global 250) report in some way on sustainability.⁷⁸

But can we trust that data? Maybe not; according to one survey, 68 percent of U.S. executives admit their companies are guilty of greenwashing, and two-thirds of executives globally questioned whether their companies' sustainability efforts were genuine.⁷⁹

“Greenwashing” refers to either intentionally misleading disclosure or inadvertently misleading disclosure about a company's

76. See Gabriela Herculano, *Green Energy and Technology Predictions for 2023 and Beyond*, NASDAQ (Dec. 20, 2022, 11:33 AM), <https://tinyurl.com/2zt8xay5> [<https://perma.cc/M8NB-J3ZQ>].

77. See, e.g., DELOITTE CONSULTING, DELOITTE 2022 CXO SUSTAINABILITY REPORT 11 (2022), <https://tinyurl.com/3xwkpc8u> [<https://perma.cc/D2K2-D6SK>] (finding that 49 percent of companies are developing new climate-friendly products or services; 67 percent are using more sustainable materials including lower-emitting products; and 57 percent are using energy-efficient or climate-friendly machinery, technologies, and equipment).

78. See *Key Global Trends in Sustainability Reporting*, KPMG, <http://tinyurl.com/4d5yrvjh> [<https://perma.cc/8KXV-DTPK>] (last visited May 21, 2024).

79. Adele Peters, *68% of Execs Admit Their Companies Are Guilty of Greenwashing*, FAST CO. (Apr. 13, 2022), <https://tinyurl.com/4tcjsmd9> [<https://perma.cc/F76F-QAQ6>].

environmental efforts and results. Companies—especially those in environmentally intensive sectors like energy, extraction (e.g., mining and logging), and heavy manufacturing—are often eager to prove to stakeholders that they are genuinely concerned about the environment or are not “bad” companies because they have adopted (or will be adopting) sustainable business practices. Some of those claims are undoubtedly fraudulent, but for purposes of this analysis, let us lay aside the fraudulent claims and assume that the vast majority of companies and their managers want to do the right thing regarding disclosures of long-dated risks. Chances are, many either lack the tools necessary to make those types of long-tail materiality judgments, or find themselves clouded by (unintentional) cognitive biases that make such assessments difficult.

For example, consider the situation with CO₂ emissions, which are a fundamental factor in climate change. The facts are clear: reducing current levels of emissions by half by 2030 is necessary to avoid the worst consequences of climate change,⁸⁰ and the private sector has an important role to play, with 10,000 publicly listed businesses responsible for 40 percent of all climate-warming emissions alone.⁸¹ Sixty-six percent of Fortune Global 500 companies have accordingly made commitments to reduce carbon emissions.⁸² If that is true—reducing emissions by half by 2030 is imperative, and companies ostensibly are on board with that goal—one would expect to see significant progress toward that goal. However, only seven percent of companies are on track to achieve their net zero targets for Scope one and two emissions at the observed rates of change.⁸³ Why?

We propose two reasons. The first is that managers do not adequately appreciate that all business risks tie either directly or indirectly to climate risk.⁸⁴ Put another way, the apertures on their “observe” and “orient” stages of the climate OODA loop are too

80. See *For a Livable Climate: Net-Zero Commitments Must be Backed by Credible Action*, UNITED NATIONS, <https://tinyurl.com/2jnvctbx> [<https://perma.cc/3W3C-4LU5>] (last visited May 21, 2024) (“To keep global warming to no more than 1.5°C – as called for in the Paris Agreement – emissions need to be reduced by 45% by 2030 and reach net zero by 2050.”).

81. See Michael Sheldrick, *Urgent Call for Corporate Climate Leadership: Report Highlights Threat to Businesses, Communities*, FORBES (Feb. 12, 2023, 11:53 PM), <https://tinyurl.com/mw5jmfpb> [<https://perma.cc/G35K-QSF6>].

82. See *Commitment Issues: Markets of Real Climate Action in the Fortune Global 500*, CLIMATE IMPACT PARTNERS (2023), <https://tinyurl.com/msrmwpxy> [<https://perma.cc/9BTX-S5DB>].

83. See *Nearly All Companies Will Miss Net Zero Goals Without at Least Doubling Rate of Carbon Emissions Reductions by 2030, Accenture Report Finds*, ACCENTURE (Nov. 1, 2022), <https://tinyurl.com/4vv7tcx6> [<https://perma.cc/N8E9-HVJZ>].

84. See Fig. 7, *infra*.

narrow. The second (and often overlooked) reason is the cognitive bias that results from the intersection of extended time, the nature of existential risk, and the related inability of people to process it appropriately.

FIGURE 7: INTERDEPENDENCY OF CLIMATE RISK WITH OTHER BUSINESS RISKS



3. Cognitive Bias and the Challenge of Modeling Time-Risk Materiality

Solving the problem of an overly narrow OODA loop is beyond the scope of this Article, other than to suggest that climate risk is not an independent risk but an interdependent risk that affects all of the other risks that businesses typically consider in making materiality and disclosure assessments. As such, disclosure stalwarts like the MD&A section of Form 10-K should reflect how climate change either creates new risks or amplifies existing risks across all aspects of a company's business rather than simply listing climate risk as one of the laundry list of risks that a company may face. The SEC's newly adopted climate disclosure rules will address this somewhat, but how effective they will be and to what degree they will move companies toward better environmental outcomes remains to be seen.

The solution to the second problem lies in recognizing and addressing an additional cognitive bias that is peculiar to long-term environmental thinking, over and above the more general cognitive biases described in Section I.D (which may also be operating here). The additional bias is this: humanity has never suffered through a global-scale catastrophe, and therefore, any global-level risk poses unique challenges to prediction because of the “observation selection effect.”⁸⁵ This is a form of cognitive bias that says that because no human has ever experienced and survived a global-scale catastrophic event in order to observe the outcome, we are essentially incapable of accurately calculating and evaluating the severity of the impacts it would have.⁸⁶ We also lack experimental data with which to counteract this bias directly.

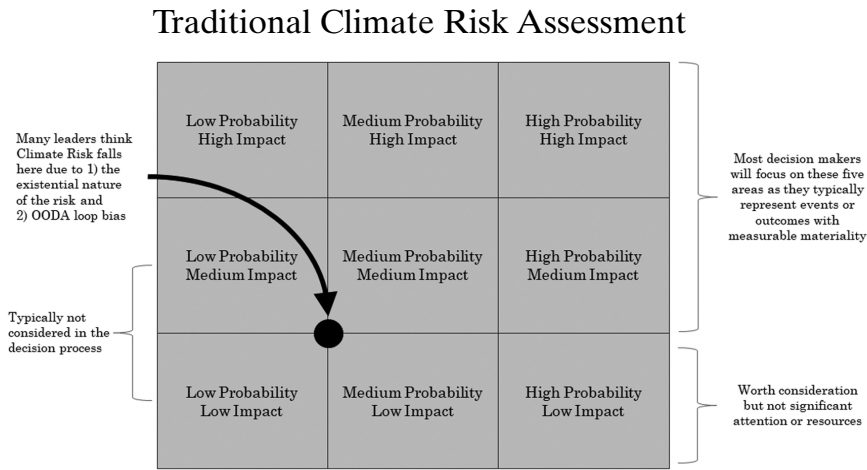
At the risk of stating the obvious, there are unique challenges to researching the nature of global catastrophic risks because it is neither feasible nor ethical to study these kinds of risks experimentally using the traditional scientific method (we have difficulty imagining the Human Subjects Review Committee at a university that would approve testing involving a mass extinction event, and if such an experiment were approved, we certainly would request to be placed in the control group). Similarly, there are no “survivors” of mass extinction events to interview and no relevant historical record to evaluate for experimental data.⁸⁷ As a result of this bias and the difficulties counter-programming it, materiality assessments of climate risk tend to ignore the time dimension that decision-makers face, which results in improper classification of environmental risk. In essence, because decision-makers are challenged to imagine the worst and fail to plan as if it will arrive any time soon, even if they can conceive it, they revert to the traditional two-axis grid for materiality and place climate risk in the lower left (low probability and low medium risk).

85. TOBY ORD, *THE PRECIPICE: EXISTENTIAL RISK AND THE FUTURE OF HUMANITY* 328 (2020).

86. *Id.*

87. See generally Milan M. Cirkovic et al., *Anthropic Shadow: Observation Selection Effects and Human Extinction Risks*, 30 *RISK ANALYSIS* 1495 (2010).

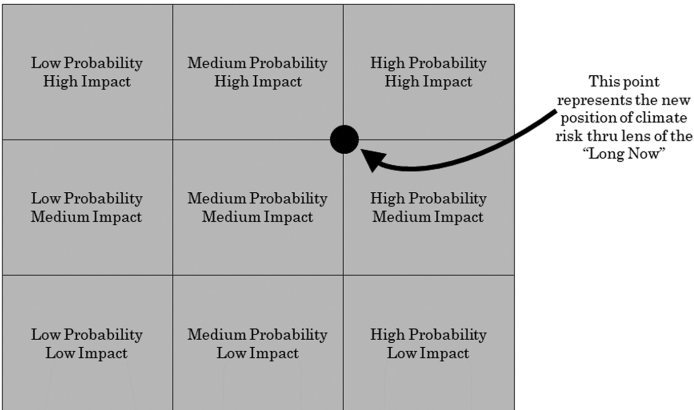
FIGURE 8: TRADITIONAL RISK ASSESSMENT MODEL SHOWING ESTIMATION OF CLIMATE RISK



One way to address this would be to artificially inflate the value of time and effectively “mandate” that climate risk should be moved to the upper right section of the grid (medium-high probability, medium-high impact, as depicted in Figure 9), but this is a crude approximation of time’s impact. Ultimately, a mandated adjustment of this type does not convey helpful information and merely confuses or dilutes the risks associated with shorter-dated outcomes. In short, it is neither rigorous nor useful as an analytical tool.

FIGURE 9: TRADITIONAL RISK ASSESSMENT MODEL SHOWING ESTIMATION OF CLIMATE RISK — ADJUSTED FOR TIME

“Long Now” Adjusted Climate Risk Assessment



4. *A Better Way to Talk About Time-Risk*

Beyond materiality matrices, a more effective way to counteract the cognitive biases that inhibit long-dated risk assessment is to explicitly require time considerations to be accounted for in materiality assessments themselves. Specifically, to require management to take three steps: first, to disclose the company's definition of "long term;" second, to identify the key long-term risks the company faces within that time frame;⁸⁸ and third, to assess where they believe the company lies along the JCS Model timeline continuum with respect to mitigating or eliminating each identified risk—that is, disclose whether the company believes there is enough information to commit to a course of action. If so, management would be required to explain why the course of action it has chosen with respect to such risks represents the optimal balance between decisional flexibility and available information. If not, management would be required to identify what information the company would need before it could commit and/or what conditions it would need to obtain before that risk became a material risk.

The process need not be overly onerous from a practical perspective. Under the SEC's newly adopted climate disclosure rules, managers will already be required to identify and classify risks as short-term (reasonably likely to manifest within the next 12 months) or long-term (reasonably likely to manifest beyond the next 12 months). Further, managers must "provide insight into material opportunities, challenges and risks, such as those presented by known material trends and uncertainties, on which the company's executives are most focused for both the short and long term, as well as the actions they are taking to address these opportunities, challenges and risks."⁸⁹

Our proposed model would expand this analysis to include all known risks, not just the known risks on which the company is "most focused," but would otherwise support the SEC's intent that management "provide insight into [climate-related] challenges and risks." It would require management to analyze how each of the identified risks could affect the company's businesses if they came to pass (without regard to likelihood), and for each risk, assign it to one of three spots on the decision/time continuum: early, optimal, or late. For "early" risks, the company would be required to identify what information or categories of information it lacked and what would

88. We are hesitant to suggest a specific definition of long-term, because it may reasonably vary by company, industry, or sector.

89. The Enhancement and Standardization of Climate-Related Disclosures for Investors, 89 Fed. Reg. 21668, 21695–96 (Mar. 28, 2024).

trigger it to move from “early” to “optimal.” For “optimal” risks, the company would be required to explain how their current activities will address the risk. For risks where the company is in the “late” part of the timeline, no additional information would be required; by definition, we assume that a “late” risk would be inside the “short now” window and, therefore, captured by the existing materiality disclosure framework.

Such a disclosure standard does several things: first, it opens the black box of risk assessment just a little and lets investors peer inside. This affords them access to contextual information that may not fit the classic securities law definition(s) of “material” but would nevertheless be important to them in understanding and evaluating how resilient and prepared companies are with respect to those risks. Second, it gives companies a mechanism for evaluating and discussing risks without diluting the classic financial materiality standard’s emphasis on near-dated hazards that pose financial risks. It also avoids imposing an amorphous and difficult-to-parse standard—to the contrary, the process we are describing shares conceptual aspects with both standard business continuity and disaster recovery planning, which is itself a well-developed and well-understood discipline,⁹⁰ and mandatory environmental and product liability disclosures that companies are required to prepare in connection with their annual financial disclosures.⁹¹

A third, albeit ancillary, benefit to companies is that to the extent that a company does not already have a mechanism for identifying

90. See generally *ISO 22301:2019*, INT’L ORG. FOR STANDARDIZATION (2019), <https://tinyurl.com/4zstpp5f> [<https://perma.cc/J8RU-249N>] (specifying the structure and requirements for implementing and maintaining a business continuity management system that develops business continuity appropriate to the amount and type of impact that the organization may or may not accept following a disruption); see also Wayne Elsey, *How and Why to Create a Business Continuity Plan*, FORBES (May 7, 2020, 7:15 AM), <http://tinyurl.com/5n6sn6xs> [<https://perma.cc/3FTL-JTXL>].

91. See *Summary by the Division of Corporation Finance of Significant Issues Addressed in the Review of the Periodic Reports of the Fortune 500 Companies*, U.S. SEC. & EXCH. COMM’N (Feb. 27, 2003), <https://tinyurl.com/38hjpyds> [<https://perma.cc/FM7T-MWFC>]; see also SEC Staff Accounting Bulletin No. 92, 58 Fed. Reg. 32843, 32844 (June 14, 1993) (“The measurement of [a contingent environmental] liability should be based on currently available facts, existing technology, and presently enacted laws and regulations, and should take into consideration the likely effects of inflation and other societal and economic factors. Notwithstanding significant uncertainties, management may not delay recognition of a contingent liability until only a single amount can be reasonably estimated. . . . Even in situations in which the registrant has not determined the specific strategy for remediation, estimates of the costs associated with the various alternative remediation strategies considered for a site may be available or reasonably estimable. While the range of costs associated with the alternatives may be broad, the minimum clean-up cost is unlikely to be zero. As additional information becomes available, changes in estimates of the liability should be reported in the period that those changes occur. . . .”).

and evaluating long-dated environmental risks and for monitoring and updating its known catalog of risks, the JCS Model provides a roadmap for what the company needs to do. While this is not the primary goal of disclosures—the primary goal of disclosures is to guide investors and provide them with information that is important and relevant to their investment decisions—the desire not to be caught without a plan is a powerful motivator for companies to begin doing something. As Justice Brandeis famously observed, “[s]unlight is said to be the best of disinfectants; electric light the most efficient policeman.”⁹² Finally, the hope is that by applying this mode of risk assessment and evaluation to their decision processes, corporate managers will become more effective in addressing future environmental and climate concerns.

CONCLUSION

Materiality is a useful construct for identifying and quantifying certain risks, but it is only one tool of many, and its utility and efficacy are ultimately limited when the consideration and evaluation of time becomes a necessary supporting component to the decision process. Nevertheless, the accretion of laws over the years, both statutory and interpretive, has enshrined materiality as the “gold standard” for disclosing risks. This may well be appropriate and adequate given securities laws’ emphasis on understanding risks and their financial implications for a company’s performance such that financial statements do not mislead. However, the very focus of materiality on financial results—whether explicit or implied—can obscure other decision-relevant (but not strictly “financial”) information that long-term investors might consider “important” and relevant to their investment decisions, and that might also affect how they think about and evaluate companies. Efforts to redefine materiality (such as through the use of “double materiality” to assess environmental impact) have the benefit of using familiar language, but by extending the concept to things that are not necessarily financial in nature, they risk stripping out some of the meaning when we say that something is “material.” They beg the question of which materiality we mean and what standard we are applying.

The decision-information model that we have proposed addresses that problem by positing an alternative analytical and disclosure framework that can exist alongside classic materiality without fundamentally upending it. By asking management to identify what

92. See LOUIS D. BRANDEIS, *What Publicity Can Do, in OTHER PEOPLE’S MONEY AND HOW BANKERS USE IT* 92, 92 (1914).

is currently known about a set of long-term risks, what they would need to know to make a decision, and what would trigger action by the company, the tool focuses on things that are knowable, scaled to human understanding, and decision-useful for investors and management alike, because they situate the company into a known place in the OODA loop process. Said more plainly, time-aligned decision-making is more likely to produce superior results in the long run. Applying our tool also avoids devolving the disclosure process into an open-ended inquiry into all possible risks that could occur, which we believe would otherwise impede potential adoption.

APPENDIX

TABLE 1: HOW GENERAL MATERIALITY IS MEASURED IN VARIOUS LEGAL AND ACCOUNTING FRAMEWORKS

	Measuring Audience	Threshold for Materiality	Degree of Certainty Required	Information is Evaluated Relative to...
Supreme Court TSC v. Northway ⁹³	Reasonable investor	Substantial likelihood... significantly altered	Would have been viewed	Total mix of information available
17 C.F.R. §230.405 ⁹⁴	Reasonable investor	Substantial likelihood	Would attach importance	Importance in determining whether to purchase
SEC SAB 99 ⁹⁵	Reasonable investor	Substantial likelihood	Would attach importance	Importance in determining whether to purchase
PCAOB AS 2015 ⁹⁶	Reasonable person Reasonable shareholder	Substantial likelihood... significantly altered Delicate assessment	Would have been viewed Would draw	Total mix of information available Inferences shareholder would draw from a given set of facts
FASB SFAC/CON 8 ⁹⁷	Reasonable person	Probable... changed or influenced	Would have changed or influenced	Judgment in the light of surrounding circumstances
AICPA SAS 138 ⁹⁸	Reasonable user	Substantial likelihood... individually or in the aggregate	Would influence	User's judgment based on the financial statements

93. TSC Indus., Inc. v. Northway, Inc., 426 U.S. 438 (1976).

94. 17 C.F.R. §230.405.

95. SEC Staff Accounting Bulletin No. 99 – Materiality, 64 Fed. Reg. 45150 (Aug. 12, 1999).

96. *AS 2105: Consideration of Materiality in Planning and Performing an Audit*, PUB. CO. ACCT. OVERSIGHT BD., <https://tinyurl.com/3abbfvjt> [<https://perma.cc/6D5V-A57W>] (last visited May 9, 2024).

97. CONCEPTUAL FRAMEWORK FOR FIN. REPORTING, CH. 3, Statement of Fin. Acct. Concepts No. 8 (FIN. ACCT. STANDARDS BD. 2018).

98. AMENDS. TO THE DESCRIPTION OF THE CONCEPT OF MATERIALITY, Statement on Auditing Standards No. 138 (AM. INST. OF CERTIFIED PUB. ACCTS. 2019).

IASB ⁹⁹	Primary user of general-purpose financial statements	Reasonably be expected	Could influence	Decisions made on the basis of those financial statements which provide financial information about a specific reporting entity
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TABLE 2: HOW CLIMATE-RELATED MATERIALITY IS MEASURED
IN VARIOUS LEGAL AND ACCOUNTING FRAMEWORKS

	Measuring Audience	Threshold for Materiality	Degree of Certainty Required	Information is Evaluated Relative to...
ISSB S1 Para. 17 ¹⁰⁰	[Not stated]	Reasonably be expected	Could affect	The entity's prospects
ISSB S1 Para. 18 ¹⁰¹	Primary user of general-purpose financial reports	Reasonably be expected	Could influence	Decisions made on the basis of general-purpose financial reports, including financial statements and sustainability-related financial disclosures and which provide information about a specific reporting entity
SEC Climate Disclosure Rules ¹⁰²	Reasonable investor	Substantial likelihood Numerical: 1% of impacted financial statement line for severe weather-related expenses	Would consider it important	Determining whether to buy or sell securities or how to vote

99. See *Amendment Issued: IASB Clarifies Its Definition of 'Material'*, IFRS FOUND. (Oct. 31, 2018), <https://tinyurl.com/463tnyn6> [<https://perma.cc/5YTQ-Y24T>].

100. See *IFRS S1 General Requirements for Disclosure of Sustainability-Related Financial Information*, IFRS FOUND., <https://tinyurl.com/2mxdhamy> [<https://perma.cc/JD3K-8VVQ>] (last visited May 19, 2024).

101. *Id.*

102. Securities Act Release No. 33-11275, 89 Fed. Reg. 25804 (Mar. 6, 2024).
