

A FUNCTIONAL APPROACH TO RISKS AND UNCERTAINTIES UNDER NEPA

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The National Environmental Policy Act (NEPA) mandates that federal agencies evaluate the environmental impacts of their proposed actions. This requires agencies to make ex ante predictions about environmental consequences that often involve a significant degree of factual risk or uncertainty. Considerable controversy exists regarding how agencies should address such risks and uncertainties. Current NEPA law adopts a largely ad hoc approach that lacks coherence and analytical rigor. Some environmentalists and legal scholars have called for a greater emphasis on worst-case analysis in environmental planning, especially after the recent Deepwater Horizon oil spill in the Gulf of Mexico and the meltdowns at the Fukushima Daiichi nuclear reactors in Japan, both of which involved the eventuation of risks dismissed ex ante as improbable. This Article proposes a functional approach to environmental risks and uncertainties under NEPA as a preferable alternative to both a worst-case analysis requirement and the morass of existing approaches. A functional approach that is sensitive to context and analytically focused is better suited to the complexities of environmental planning. It is consonant with current NEPA law, but also can refine existing law to develop requirements that focus on effectuating NEPA's purposes by producing useful environmental information.

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INTRODUCTION

The National Environmental Policy Act (NEPA) requires federal agencies to prepare and to release to the public an Environmental Impact Statement (EIS) before taking any major action “significantly affecting the quality of the human environment.”¹ This information-forcing requirement serves two objectives: (1) to induce agencies to consider environmental impacts in their decision making, and (2) to inform the public about the agencies’ decision-making processes.² Because NEPA mandates that agencies evaluate the environmental impacts of a proposed action before the action occurs, NEPA requires agencies to make *ex ante* predictions about the consequences of actions they are considering. With some proposed actions, the consequences are relatively clear and certain. In many, if not most, cases, however, predicting environmental consequences involves a significant degree of factual risk or uncertainty.³

This factual risk and uncertainty, in turn, has generated legal controversy about what consequences NEPA requires an agency to evaluate. If it is possible but highly unlikely that a nuclear reactor will have an accident that results in a meltdown of its reactor core, is a nuclear meltdown an “environmental impact” of the construction and operation of a nuclear reactor?⁴ If it is unclear whether or not an herbicide causes cancer, is an increased risk of cancer an “environmental impact” of a program to spray the herbicide on forests?⁵

Especially where potential consequences of an agency action include unlikely but catastrophic outcomes such as a nuclear meltdown, it is intuitively appealing to resort to a worst-case analysis to address risks and uncertainties. If something terrible could happen, even if it probably will

1. 42 U.S.C. § 4332(2)(C) (2006). *See also infra* note 16 and accompanying text.

2. *See* Baltimore Gas & Elec. Co. v. Natural Res. Def. Council, Inc., 462 U.S. 87, 97 (1983); *cf.* Carol M. Rose, *Scientific Innovation and Environmental Protection: Some Ethical Considerations*, 32 ENVTL. L. 755, 768 (2002) (describing NEPA as an “information-forcing” statute).

3. Although risk and uncertainty are synonyms to the extent both can mean the possibility that something may or may not occur, *see* WEBSTER’S NINTH NEW COLLEGIATE DICTIONARY 1018, 1283 (1986), risk focuses more on the likelihood of occurrence while uncertainty emphasizes the lack of knowledge about what will occur. Economist Frank Knight distinguished between risk, which he regarded as measurable, and uncertainty, which is unmeasurable. FRANK KNIGHT, RISK, UNCERTAINTY AND PROFIT 19-21 (1921). Legal scholars often employ Knight’s distinction. *See, e.g.*, Daniel A. Farber, *Uncertainty*, 99 GEO. L.J. 901, 903 (2011); Frank Partnoy, *The Shifting Contours of Global Derivatives Regulation*, 22 U. PA. J. INT’L ECON. L. 421, 428-29 (2001); Cass R. Sunstein, *Irreversible and Catastrophic*, 91 CORNELL L. REV. 841, 876 (2006); Eric L. Talley, *On Uncertainty, Ambiguity, and Contractual Conditions*, 34 DEL. J. CORP. L. 755, 759 (2009).

4. *See* Carolina Env’tl. Study Group v. United States, 510 F.2d 796 (D.C. Cir. 1975).

5. *See* Save Our Ecosystems v. Clark, 747 F.2d 1240 (9th Cir. 1984); S. Or. Citizens Against Toxic Sprays (SOCATS) v. Clark, 720 F.2d 1475 (9th Cir. 1983).

not, then it seems obvious that agencies should consider that possibility before embarking on the action. Considering the possibility of a severe outcome could allow the agency to take action to reduce the risk, to plan for responses if the risk were to eventuate, or to reconsider taking the action in the first place.

A 1978 NEPA regulation required agencies to address uncertainties with worst-case analyses.⁶ After it generated significant controversy,⁷ that regulation was amended in 1986 to rescind the worst-case requirement, and replaced with a more flexible mandate that agencies must discuss the uncertainties in their analyses.⁸ In the twenty-five years since, no clear understanding has arisen as to how agencies should address uncertainties in predicting environmental consequences in their NEPA documents. Agencies have addressed the issue on an ad hoc rather than systematic basis, and courts reviewing challenges to agency NEPA analyses have treated uncertainties erratically as well.

In the face of this mess, environmentalists and legal scholars periodically call for reinstating the worst-case requirement from the 1978 regulation. Most recently, the Deepwater Horizon oil spill in the Gulf of Mexico in 2010 and the meltdowns at the Fukushima Daiichi nuclear reactors in Japan in 2011 renewed calls for revitalizing worst-case analysis in NEPA as a means of better addressing catastrophic environmental risks.⁹

6. 40 C.F.R. § 1502.22(b) (1979).

7. See *infra* note 55 and accompanying text.

8. 40 C.F.R. § 1502.22(b) (1986).

9. See, e.g., Daniel H. Cole, *NEPA and the Deepwater Horizon Oil Spill*, LAW, ECON. & CYCLING (May 2, 2010, 8:13 AM), <http://cyclingprof.blogspot.com/2010/05/nepa-and-deepwater-horizon-oil-spill.html> (“[A]n EIS that includes a worst-case analysis is more likely to result in additional safety measures being imposed than an EIS that does not include one. For that reason, I support [Holly Doremus’] call for CEQ to reintroduce a worst-case analysis requirement into its NEPA regulations.”); Holly Doremus, *A Great Case for Worst Case Analysis*, LEGAL PLANET (May 1, 2010), <http://legalplanet.wordpress.com/2010/05/01/a-great-case-for-worst-case-analysis/> (“The recent Gulf oil disaster offers a powerful argument for going back to the original requirement for worst-case analysis, which the current regulation allows agencies to avoid.”); Lesley McAllister, *Learning from Another Worst-Case Scenario*, ENVTL. LAW PROF BLOG (Mar. 15, 2011), http://lawprofessors.typepad.com/environmental_law/2011/03/learning-from-another-worst-case-scenario.html (“[A]s we make energy policies, our decision-making processes must identify and analyze worst case scenarios. As we learned with the BP oil spew (I can’t call it a spill when it wasn’t) and now this, worst case scenarios really can happen.”); Dennis Takahashi Kelso, Exec. Vice President, Ocean Conservancy, Written Testimony to the Nat’l Comm’n on the BP Deepwater Horizon Oil Spill and Offshore Drilling 8 (Sept. 22, 2010), http://act.oceanconservancy.org/site/DocServer/Delete.100927_Dennis_Kelso_Nat_1_Oil_Spill_Comm_Written_Testimo.pdf%20?docID=6421 (arguing that the failures leading to the Deepwater Horizon oil spill “point to the need for more rigorous requirements for worst-case scenario analyses” and noting that “[d]espite their importance, now underscored by the BP spill,

This Article argues against proposals to require agencies to analyze worst-case scenarios in their NEPA analyses, identifying three obstacles to using worst-case analyses for NEPA planning. First, it is often unclear what scenario constitutes the worst case. Some scenarios, for example, must be too unlikely to warrant examination. Any serious proposal for worst-case analysis therefore would have to limit itself to significant risks and uncertainties, a complex concept that necessitates a context-sensitive standard.

Second, risks and uncertainties are so pervasive in environmental planning that it would be impossible to implement an across-the-board rule that requires agencies to discuss all significant risks and uncertainties in terms of a worst case. Risks and uncertainties play varying roles in environmental planning, and NEPA law should reflect that variation with a flexible standard.

Third, worst-case analysis, by singling out one low-probability adverse outcome for focused analysis, conflicts with the political and institutional realities of agency decision making. Agencies will tend to downplay the possibility of low-probability risks, and project opponents will tend to concentrate on them. As a result of this dynamic, a rule requiring worst-case analysis would tend to create conflict over what scenario represents the appropriate “worst case” instead of focusing on how to plan in the face of risks and uncertainties that create a range of possible outcomes.

Thus, the apparently simple and clear mandate of worst-case analysis falls apart in the complicated realities of environmental planning. Despite the intuitive appeal of worst-case analysis, a worst-case requirement would not produce the benefits that its proponents envision. NEPA is widely recognized as an imperfect statute that generates too much rote discussion and not enough penetrating analysis. Proponents of worst-case analysis see a worst-case requirement as an opportunity to reverse this imbalance, to increase clarity and critical thinking in agencies’ NEPA analyses. In fact, however, a worst-case requirement would exacerbate rather than redress NEPA’s existing flaws.

As a preferable alternative to both a worst-case analysis requirement and the morass of the existing ad hoc approach, this Article proposes a functional approach to environmental risks and uncertainties. A functional approach is sensitive to context, focusing on those characteristics of risks—including probability, severity, and uncertainty—that determine which risks are significant and deserve consideration. A functional approach also requires agencies to focus on how risks and uncertainties affect their decisions instead of simply requiring disclosure of relevant risks and uncertainties. This will increase the clarity and utility of agencies’ discussions of

worst-case scenarios have not been part of the National Environmental Policy Act (NEPA) process”).

risks and uncertainties without overwhelming agencies or the public with excessive information. Finally, vigorous enforcement of procedural standards that govern administrative processes will counteract biases in both agencies and the interested public that can undermine the NEPA process generally, and discussions of risks and uncertainties in particular. A functional approach is well suited to the complexities of environmental planning. It is consonant with current NEPA law, but also can refine existing law to develop requirements that focus on effectuating NEPA's purposes by producing useful environmental information.

I. NEPA GENERALLY

NEPA¹⁰ is often called the “Magna Carta” of environmental law.¹¹ NEPA's objectives are ambitious: “to use all practicable means and measures . . . to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans.”¹² Its scope is sweeping: it applies to all “major Federal actions significantly affecting the quality of the human environment”¹³ and to “all agencies of the Federal Government.”¹⁴

10. 42 U.S.C. §§ 4321–4370f (2006).

11. See, e.g., Richard J. Lazarus, *Judging Environmental Law*, 18 TUL. ENVTL. L.J. 201, 209 (2004); Daniel R. Mandelker, *The National Environmental Policy Act: A Review of Its Experience and Problems*, 32 WASH. U. J.L. & POL'Y 293, 293 (2010); Arthur W. Murphy, *The National Environmental Policy Act and the Licensing Process: Environmentalist Magna Carta or Agency Coup De Grace?*, 72 COLUM. L. REV. 963, 963 (1972); Kenneth S. Weiner, *NEPA and State NEPAs: Learning from the Past, Foresight for the Future*, 39 ENVTL. L. REP. (ENVTL. L. INST.) 10,675, 10,675 (2009); cf. COUNCIL ON ENVTL. QUALITY, *THE NATIONAL ENVIRONMENTAL POLICY ACT: A STUDY OF ITS EFFECTIVENESS AFTER TWENTY-FIVE YEARS 1* (1997), available at <http://ceq.hss.doe.gov/nepa/nepa25fn.pdf> (“The National Environmental Policy Act (NEPA) is the foundation of modern American environmental protection.”).

12. 42 U.S.C. § 4331(A) (2006).

13. 42 U.S.C. § 4332(2)(C) (2006). Regulations issued by the Council on Environmental Quality define major federal actions as “actions with effects that may be major and which are potentially subject to Federal control and responsibility,” noting that federal actions tend to fall within one of four categories: “[a]doption of official policy,” “[a]doption of formal plans,” “[a]doption of programs,” or “[a]pproval of specific projects.” 40 C.F.R. § 1508.18 (2011). An action by a state or private entity may constitute a major federal action for NEPA purposes if the state or private action cannot go forward without federal approval. See *Mayaguezanos por la Salud y el Ambiente v. United States*, 198 F.3d 297, 302 (1st Cir. 1999).

14. 42 U.S.C. § 4332(2). “[A]ll agencies of the Federal Government” does not include the Congress, the Judiciary, or the Executive Office of the President. 40 C.F.R. § 1508.12 (2011). Many states have enacted “so-called mini-NEPAs” that operate similarly to NEPA but apply to state, and sometimes private, actions. Michael B. Gerrard & Michael Herz, *Harnessing Information Technology to Improve the Environmental Impact Review Process*, 12 N.Y.U. ENVTL. L.J. 18, 21 (2003); see, e.g., California Environmental Quality Act, CAL. PUB.

NEPA requires federal agencies to consider the environmental consequences of proposed major federal actions.¹⁵ In particular, NEPA requires a federal agency to prepare an EIS before taking any major action “significantly affecting the quality of the human environment.”¹⁶ The EIS must describe, among other things, the proposed action’s “environmental impact” and “adverse environmental effects which cannot be avoided,” as well as “alternatives to the proposed action.”¹⁷ In short, NEPA “require[s] that agencies take a ‘hard look’ at environmental consequences.”¹⁸ But NEPA’s requirements are procedural, not substantive.¹⁹ So long as “the adverse environmental effects of the proposed action are adequately identified and evaluated, the agency is not constrained by NEPA from deciding that other values outweigh the environmental costs.”²⁰

To coordinate implementation of NEPA across the federal government, NEPA established the Council on Environmental Quality (CEQ) within the Executive Office of the President.²¹ CEQ issues regulations interpreting NEPA.²² Because NEPA’s key provision requiring an EIS

RES. CODE §§ 21000–21178.1 (West 2011); Massachusetts Environmental Policy Act, MASS. GEN. LAWS ch. 30, § 61–62H (2011); New York State Environmental Quality Review Act, N.Y. ENVTL. CONSERV. LAW §§ 8-0101 to -0117 (McKinney 2011); State Environmental Policy Act, WASH. REV. CODE §§ 43.21C.010–.914 (2011).

15. See *Vt. Yankee Nuclear Power Corp. v. Natural Res. Def. Council, Inc.*, 435 U.S. 519, 553 (1978).

16. 42 U.S.C. § 4332(2)(C). Not every federal action necessitates a full EIS. To determine whether the environmental impacts of a proposed action will be significant enough to warrant a full EIS, the agency may prepare an Environmental Assessment. See 40 C.F.R. §§ 1501.4(b)-(c), 1508.9 (2011). If, based on the Environmental Assessment, the agency concludes that the proposed action will not significantly impact the environment, it will issue a Finding of No Significant Impact in lieu of an EIS. See 40 C.F.R. § 1508.13 (2011). See generally *Dep’t of Transp. v. Pub. Citizen*, 541 U.S. 752, 756–58 (2004) (providing an overview of EISs, Environmental Assessments, and Findings of No Significant Impact).

17. 42 U.S.C. § 4332(2)(C)(i)–(iii).

18. *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 350 (1989) (quoting *Kleppe v. Sierra Club*, 427 U.S. 390, 410 n.21 (1976)).

19. See *Strycker’s Bay Neighborhood Council v. Karlen*, 444 U.S. 223, 227–28 (1980).

20. *Robertson*, 490 U.S. at 350.

21. 42 U.S.C. §§ 4342, 4344 (2006).

22. CEQ has no statutory rulemaking authority that would obligate federal agencies to comply with its regulations. See Edward A. Fitzgerald, *The Rise and Fall of Worst Case Analysis*, 18 U. DAYTON L. REV. 1, 8 (1992). In 1970, three months after Congress enacted NEPA, President Nixon issued an executive order instructing CEQ to issue guidelines to assist federal agencies in implementing NEPA. Exec. Order No. 11,514, 3 C.F.R. 104, 106 (1971). Pursuant to this executive order, in the early 1970s CEQ issued and periodically amended nonbinding NEPA guidance. See Fitzgerald, *supra*, at 8. In 1977, President Carter issued an executive order authorizing CEQ to issue regulations and directing federal agencies to follow CEQ’s regulations. See Exec. Order No. 11,991, 3 C.F.R. 123, 124 (1978); see also *Churchill Cnty. v. Norton*, 276 F.3d 1060, 1072 n.7 (9th Cir. 2001) (“Although initially advisory in nature, the [CEQ’s] regulations were made binding on the administrative agencies by Executive Order No. 11991, 3 C.F.R. § 124. ‘CEQ’s interpretation of NEPA is

provides only a “cryptic mandate,” CEQ’s more detailed regulations are considered “the key to compliance with NEPA.”²³

By all accounts, NEPA has enjoyed mixed success over its forty-year history in accomplishing its ambitious goals. On the upside, NEPA’s requirement that agencies consider the environmental consequences of their decisions before taking action has put the environment on the agenda of agencies throughout the federal government, many of which have not traditionally viewed environmental protection as one of their considerations.²⁴ Most studies have found that NEPA “has had a moderately positive effect” in inducing agencies to integrate environmental values into their decision making.²⁵ By requiring the public disclosure of EISs and Environmental Assessments, NEPA has increased public access to information about the environmental consequences of government action and has increased the transparency of agency decision-making processes more generally.²⁶

On the downside, NEPA has been criticized both by those who think its effects on environmental protection are weak and by those who view its requirements as overly burdensome. Despite the differences in perspective between these two groups of critics, one of which thinks NEPA should do more and one of which thinks NEPA should do less, their complaints share a common theme asserting that NEPA tends to result in “burdensome procedural formalities while accomplishing little or nothing of substance.”²⁷ Environmentalists complain that NEPA lacks efficacy without substantive commands²⁸ and that agencies approach their NEPA analyses with an

entitled to substantial deference.’” (quoting *Andrus v. Sierra Club*, 442 U.S. 347, 358 (1979))).

23. Mandelker, *supra* note 11, at 297.

24. Bradley C. Karkkainen, *Toward a Smarter NEPA: Monitoring and Managing Government’s Environmental Performance*, 102 COLUM. L. REV. 903, 904 (2002) (“[NEPA] forces agency managers to identify and confront the environmental consequences of their actions, about which they otherwise would remain ignorant.”); *The National Environmental Policy Act 40th Anniversary Symposium*, 40 ENVTL. L. REP. (ENVTL. L. INST.) 11,183, 11,187 (2010) (transcribing Nicholas Yost’s comment that “NEPA has achieved success, not only in its stated goal of building the environment into governmental decisionmaking, forcing agencies, if you will, to look before they leap environmentally, but it’s changed the way we think”).

25. Mandelker, *supra* note 11, at 294; *see also* GEORGE CAMERON COGGINS ET AL., FEDERAL PUBLIC LAND AND RESOURCES LAW 270 (6th ed. 2007) (“[T]here are numerous examples where NEPA prompted the government to think more broadly and deeply about environmental consequences and values.”); Eric Biber, *Too Many Things to Do: How to Deal with the Dysfunctions of Multiple-Goal Agencies*, 33 HARV. ENVTL. L. REV. 1, 39 (2009) (“[S]ome observers of the agency decision-making process have argued that NEPA has fundamentally changed how agencies operate.”).

26. Karkkainen, *supra* note 24, at 904–05.

27. *Id.* at 905.

28. Alyson C. Flournoy et al., *Harnessing the Power of Information to Protect Our Public Natural Resource Legacy*, 86 TEX. L. REV. 1575, 1580 (2008) (identifying NEPA’s “lack of substantive force” as the statute’s “most frequently identified shortcoming”); Joseph L. Sax,

overabundance of boilerplate language and a lack of critical and imaginative thinking.²⁹ Critics troubled by the burdens NEPA imposes note that its requirements can slow down, increase the costs of, and even sink worthwhile and beneficial agency projects.³⁰

In addition to these criticisms, NEPA also has suffered from the realities of implementation in a more complex and less predictable world than its enactors contemplated:

NEPA was born in an era that had faith in bureaucratic comprehensive rationality, the idea that predictive analysis of a broad class of administrative decisions would produce rational decision making that would consider environmental impacts. This hope disappeared with the understanding that environmental systems are complex, dynamic, nonlinear, and mutually independent, making environmental prediction a much more difficult task. These complexities make the application of NEPA to actions and programs a much more difficult problem than initially expected.³¹

These realities mean that agencies are virtually always working in circumstances of incomplete information and uncertainty; the ever-present questions facing agencies and courts are, under such circumstances, how much information and analysis is enough, and how should risks and uncertainties be reflected in agencies' NEPA documents so as best to effectuate NEPA's objectives?

The (Unhappy) Truth About NEPA, 26 OKLA. L. REV. 239, 239 (1973) ("I know of no solid evidence to support the belief that requiring articulation, detailed findings or reasoned opinions enhances the integrity or propriety of the administrative decisions. I think the emphasis on the redemptive quality of procedural reform is about nine parts myth and one part coconut oil.").

29. See Karkkainen, *supra* note 24, at 906 ("Agencies have . . . routiniz[ed] and compartmentaliz[ed] their response, effectively marginalizing [NEPA's] operative effect and thereby circumventing NEPA's core purpose."); *id.* at 923 ("EISs . . . tend to consist of exhaustive compilations of recycled information, sometimes of dubious quality.").

30. Flournoy et al., *supra* note 28, at 1583 (citing the criticism that NEPA generates "overly lengthy documents that are less valuable than more concise, focused documents would be"); Karkkainen, *supra* note 24, at 905 (noting that criticisms "bemoan the length and cost of the NEPA process"); Mandelker, *supra* note 11, at 296 ("Another criticism of NEPA is that the statute has been used to obstruct decisions by federal agencies by slowing down agency decision-making, with negative effects on the ability of agencies to carry out their statutory duties.").

31. Mandelker, *supra* note 11, at 294 (footnote omitted); see also Karkkainen, *supra* note 24, at 906 ("NEPA ambitiously, and naively, demands the impossible: comprehensive, synoptic rationality, in the form of an exhaustive, one-shot set of *ex ante predictions* of expected environmental impacts." (emphasis added)).

II. NEPA'S TROUBLED HISTORY WITH RISKS AND UNCERTAINTIES

With most proposed federal actions, there is some degree of risk or uncertainty about the environmental consequences.³² Questions about how federal agencies are to comply with NEPA in the face of uncertainty or risk about the consequences of a project accordingly plagued NEPA from the outset.³³ Given the pervasiveness of risk and uncertainty in environmental planning, NEPA must require an agency to discuss in some form the uncertainty associated with possible environmental consequences of its proposed action for the agency's analysis to be realistic and useful. Exactly what is required in such a discussion, however, has never been clear.

In one early NEPA case from 1970, *Carolina Environmental Study Group v. United States*,³⁴ for example, the D.C. Circuit rejected a claim that the Atomic Energy Commission violated NEPA by granting a construction license for two nuclear reactors without fully considering the consequences of a nuclear meltdown at the facilities. The Commission's analysis had acknowledged that "the consequences [of meltdowns] could be severe," but concluded that "the probability of their occurrence is so small that their environmental risk is extremely low."³⁵ The court held that the Commission had met its obligations under NEPA, noting that "[t]here is a point at which the probability of an occurrence may be so low as to render it almost totally unworthy of consideration."³⁶

More generally, courts in early NEPA cases adopted a "rule of reason" by which to review the adequacy of EISs.³⁷ As a subsidiary to the rule of reason, courts held that agencies need not address "remote and speculative possibilities" in their NEPA analyses.³⁸ Courts sometimes invoked this subsidiary principle to limit the range of possible consequences that NEPA required agencies to consider in their analyses of environmental impacts. For example, in a 1977 case, *National Citizens Committee for Broadcasting v. FCC*,³⁹ the D.C. Circuit held that the possibility that changes to the FCC's fairness doctrine would "result in more ads for environmentally dangerous products, more use of such products, and therefore more harm to the

32. See *supra* text accompanying note 31.

33. Cf. *Sierra Club v. Sigler*, 695 F.2d 957, 970 (5th Cir. 1983) ("Because NEPA is silent on the problem of uncertainty . . . the courts have been forced to grapple with this issue . . .").

34. 510 F.2d 796 (D.C. Cir. 1975).

35. *Id.* at 799.

36. *Id.*

37. See, e.g., *Nat'l Helium Corp. v. Morton*, 486 F.2d 995, 1002 (10th Cir. 1973); *Natural Res. Def. Council, Inc. v. Morton*, 458 F.2d 827, 834 (D.C. Cir. 1972).

38. See, e.g., *Natural Res. Def. Council, Inc. v. Morton*, 458 F.2d at 838.

39. 567 F.2d 1095 (D.C. Cir. 1977).

environment” was too “remote and speculative” to warrant consideration in an EIS.⁴⁰

When CEQ first issued NEPA interpretive regulations in 1978,⁴¹ it addressed the problem of risks and uncertainties with a provision requiring federal agencies to include a “worst-case analysis” when proceeding with a proposal in the face of uncertainty about its environmental impacts.⁴² Although some commenters on the regulation “expressed concern that this requirement would place undue emphasis on the possible occurrence of adverse environmental consequences regardless of how remote the possibility might be,” CEQ believed that it addressed this concern by directing agencies to indicate in their analyses the likelihood of the worst-case scenario’s occurrence.⁴³ Subsequent guidance from CEQ advised that agencies faced with uncertainty were to consider the full spectrum of “all known possible” outcomes, from those with low probability and great impact to those with higher probability and less impact.⁴⁴

A series of cases in the early 1980s applied CEQ’s worst-case requirement. In the most widely known case, *Sierra Club v. Sigler*,⁴⁵ the Fifth Circuit held that the worst-case regulation required the Army Corps of Engineers, before issuing permits for construction of a deepwater port and crude oil distribution system at Galveston, Texas, to analyze the consequences of a worst-case accident scenario in which a supertanker would spill its entire load of oil into Galveston Bay.⁴⁶ The Corps of Engineers had dismissed the likelihood of such an accident as “remote.”⁴⁷ The Fifth Circuit agreed—or at least accepted for the purposes of argument—that “the possibility of a total cargo loss by a supertanker is remote,” but held that CEQ’s worst-case regulation required analysis of the scenario because “a total cargo loss *could* occur and *could* wreak catastrophic environmental damage in the Bay.”⁴⁸ In so holding, the Fifth Circuit reasoned that CEQ’s

40. *Id.* at 1098 n.3; *see, e.g.*, *Concerned About Trident v. Rumsfeld*, 555 F.2d 817, 828 (D.C. Cir. 1977) (noting that an EIS is “not required to discuss remote and highly speculative consequences” of a project).

41. National Environmental Policy Act—Regulations, 43 Fed. Reg. 55,978 (Nov. 29, 1978).

42. 40 C.F.R. § 1502.22(b) (1979); *see also* National Environmental Policy Act—Regulations, 43 Fed. Reg. at 55,984 (describing section 1502.22 as requiring each agency to “prepare a worst case analysis of the risk and severity of possible adverse environmental impacts when it proceeds with a proposal in the face of uncertainty”).

43. National Environmental Policy Act—Regulations, 43 Fed. Reg. at 55,984.

44. Forty Most Asked Questions Concerning CEQ’s National Environmental Policy Act Regulations, 46 Fed. Reg. 18,026, 18,032 (Mar. 23, 1981) (to be codified at 42 C.F.R. pts. 1500-1508) (emphasis omitted).

45. 695 F.2d 957 (5th Cir. 1983).

46. *Id.* at 972.

47. *See id.* at 973.

48. *Id.* at 974.

worst-case regulation had superseded prior NEPA precedent holding that agencies need not consider remote consequences of proposed actions.⁴⁹ The Fifth Circuit recognized, however, that not every hypothetical scenario required evaluation; the court contrasted “phantasmagoria hypothesized without a firm basis in evidence and the actual circumstances of the contemplated project,” which would not require discussion, with scenarios “where a real possibility of the occurrence has been proved,” which would require discussion.⁵⁰

Subsequent cases read the worst-case requirement perhaps even more broadly. In two cases addressing proposals by the Bureau of Land Management (BLM) to spray herbicides in Oregon forests, the Ninth Circuit held that CEQ’s worst-case regulation required agencies to examine worst-case scenarios even if they were extremely unlikely. In *Southern Oregon Citizens Against Toxic Sprays, Inc. v. Clark*,⁵¹ the court rejected BLM’s argument that a situation must be “reasonably probable” to require analysis, holding that an agency “may not omit the analysis only because it believes that the worst case is unlikely.”⁵² In *Save Our Ecosystems v. Clark*,⁵³ the Ninth Circuit read *Sigler* to “emphasize[] that the mere fact that the possibility of an event occurring is remote or unlikely does not obviate the necessity to do a worst case analysis” and opined that a 1-in-10,000 risk of a catastrophic outcome would require analysis.⁵⁴

In the wake of these and other cases, pressure mounted on CEQ to clarify, amend, or repeal the worst-case regulation to lessen the burden on agencies with respect to low-probability environmental risks. Agencies, project proponents, and some commentators believed that cases interpreting the regulation were pulling agencies into speculative hypothetical scenarios with little practical value.⁵⁵ In response, CEQ amended its regulations in 1986 to rescind the worst-case analysis regulation and replace it with a requirement that agencies evaluate “reasonably foreseeable significant adverse impacts” of proposed actions, which “includes impacts which

49. See *id.* at 973–74.

50. *Id.* at 975 n.14.

51. *S. Or. Citizens Against Toxic Sprays, Inc. (SOCATS) v. Clark*, 720 F.2d 1475 (9th Cir. 1983).

52. *Id.* at 1478–79.

53. *Save Our Ecosystems v. Clark*, 747 F.2d 1240 (9th Cir. 1984).

54. *Id.* at 1245 & n.6.

55. National Environmental Policy Act Regulations, 50 Fed. Reg. 32,234, 32,234 (Aug. 9, 1985) (to be codified at 40 C.F.R. pt. 1502) (“CEQ is concerned that the requirement to prepare a ‘worst case analysis’ in certain circumstances has been the impetus for judicial decisions which require federal agencies to go beyond the ‘rule of reason’ in their analysis of potentially severe impacts.”); *id.* at 32,236 (“Many commentators thought that either the regulation itself or recent judicial decisions from the U.S. Court of Appeals for the Ninth Circuit required agencies to go beyond the ‘rule of reason.’ ”).

have catastrophic consequences, even if their probability of occurrence is low, provided that the analysis of the impacts is supported by credible scientific evidence, is not based on pure conjecture, and is within the rule of reason.”⁵⁶ CEQ explained that it rescinded the worst-case requirement because it was “an unproductive and ineffective method . . . which can breed endless hypothesis and speculation.”⁵⁷ It linked its amended regulation to the early NEPA case law invoking the “rule of reason” to hold that EISs “need not discuss remote and highly speculative consequences.”⁵⁸ The amended regulation is consistent with other NEPA regulations stating that federal agencies must examine the “reasonably foreseeable” effects of their actions.⁵⁹

Since CEQ amended its regulations in 1986 to remove the worst-case analysis requirement, courts have addressed questions of what NEPA requires with respect to environmental risks and uncertainties with a hodgepodge of existing doctrine. Many cases rely on the rule of reason’s subsidiary principle that agencies need not analyze “remote and speculative” possible consequences of a proposed agency action. Courts have applied this principle in several different ways to limit the scope of impacts agencies must consider in their NEPA analyses.

56. National Environmental Policy Act Regulations; Incomplete or Unavailable Information, 51 Fed. Reg. 15,618, 15,625-26 (Apr. 25, 1986) (to be codified at 40 C.F.R. pt. 1502). CEQ initially had attempted to address controversy over the worst-case regulation through guidance. See Proposed Guidance Memorandum for Federal Agency NEPA Liaisons, 48 Fed. Reg. 36,486 (Aug. 11, 1983) (to be codified at 40 C.F.R. pts. 1502 & 1508). CEQ proposed guidance would have advised that an agency’s worst-case analysis under the regulation “need only examine the reasonably foreseeable effects of its proposed action”—that is, “there is an initial threshold of probability which must be crossed before Section 1502.22 comes into play.” *Id.* at 36,487; see also *id.* (opining that agencies need not describe in their NEPA analyses “speculative information or potential adverse impacts with an extremely low probability of occurrence”). CEQ withdrew that proposed guidance in 1984 based on public comments received on it. Withdrawal of Proposed Guidance Memorandum of August 11, 1983, 49 Fed. Reg. 4803 (Feb. 8, 1984) (to be codified at 40 C.F.R. pts. 1502 & 1508).

57. National Environmental Policy Act Regulations; Incomplete or Unavailable Information, 51 Fed. Reg. at 15,620; see also National Environmental Policy Act Regulations, 50 Fed. Reg. at 32,236 (criticizing the worst-case requirement on the ground that it invited agencies to speculate and to engage in a “limitless . . . inquiry”); *Modernizing the NEPA Process in the Context of the Gulf Disaster*, 40 *Envtl. L. Rep.* (Envtl. Law Inst.) 11,147, 11,157 (Nov. 2010) (reporting Edward A. Boling, Senior Counsel, Council on Environmental Quality, as stating that the “purpose in revising that regulation in 1986 was to address a line of cases where the courts were increasingly requiring agencies to undertake a wholly speculative analysis that really wasn’t supported by any recent environmental documentation”).

58. National Environmental Policy Act Regulations; Incomplete or Unavailable Information, 51 Fed. Reg. at 15,621 (quoting *Trout Unlimited v. Morton*, 509 F.2d 1276, 1283 (9th Cir. 1974)) (internal quotation marks omitted). The Supreme Court upheld the new regulation in *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 354–56 (1989).

59. See 40 C.F.R. §§ 1502.16, 1508.8(b) (2010).

In some cases, courts hold that NEPA does not require an agency to consider a scenario because the chain of causation between the agency action and the scenario is too attenuated. For example, the Ninth Circuit held that NEPA did not require the Air Force, before approving the installation of radio towers in Alaska that would be part of a communications network during and after a nuclear war, to evaluate the possibility that installing the radio towers would increase the probability of nuclear war and would be a target in a nuclear war.⁶⁰ The court reasoned that “the nexus between construction of [the radio towers] and nuclear war is too attenuated to require discussion of the environmental impacts of nuclear war in an environmental assessment or EIS.”⁶¹

In other cases, courts employ the “remote and speculative” principle to hold that NEPA does not require an agency to analyze a possibly catastrophic outcome, even though the chain of causation between the proposed agency action and the outcome is direct, because the likelihood of the catastrophic outcome is very low. The Ninth Circuit thus held that NEPA did not require the Navy to assess the environmental consequences of an accidental nuclear explosion at a submarine base because the probability of such an accident had been determined to be “infinitesimal.”⁶²

In a third type of case, courts have held that agencies did not have to analyze a consequence because the likelihood of the consequence was unproven. For example, the Fifth Circuit held that the Department of Housing and Urban Development, in evaluating the consequences of a proposed urban redevelopment project that included a new Walmart store, did not have to analyze the effects of “additional national retailers attracted by Walmart’s presence” because the plaintiffs had not shown “that such changes will likely occur or are planned.”⁶³

Finally, a fourth category of cases hold that uncertainties in how an agency action will be implemented through additional future actions render

60. See *No GWEN Alliance v. Aldridge*, 855 F.2d 1380, 1385–86 (9th Cir. 1988).

61. *Id.* at 1386; see, e.g., *N.J. Dept. of Env’tl. Prot. v. U.S. Nuclear Regulatory Comm’n*, 561 F.3d 132, 142 (3d Cir. 2009) (holding that NEPA did not require the Nuclear Regulatory Commission to discuss the consequences of a terrorist attack by an aircraft on a nuclear generating facility because “there is no ‘reasonably close causal relationship’” between the decision to relicense the facility and the risk of a terrorist attack by aircraft); *Presidio Golf Club v. Nat’l Park Serv.*, 155 F.3d 1153, 1163 (9th Cir. 1998) (holding that the National Park Service was not required to discuss the “highly attenuated chain of causation” whereby a new public golf clubhouse might compete with an existing private golf clubhouse and thereby might result in environmental consequences).

62. *Ground Zero Ctr. for Non-Violent Action v. U.S. Dep’t of the Navy*, 383 F.3d 1082, 1090 (9th Cir. 2004); see also *Warm Springs Dam Task Force v. Gribble*, 621 F.2d 1017, 1026–27 (9th Cir. 1980) (holding that the Army Corps of Engineers did not need to discuss the possibility that a catastrophic earthquake could cause a dam to fail where the agency’s analysis concluded such a risk was insubstantial).

63. *Coliseum Square Ass’n v. Jackson*, 465 F.3d 215, 237–38 (5th Cir. 2006).

a potential impact remote and speculative, and therefore outside of NEPA's mandate. Thus, the Second Circuit held that the Fish and Wildlife Service did not have to consider the site-specific impacts of a Depredation Order allowing state and local governments to kill double-breasted cormorants, a migratory bird, because the Fish and Wildlife Service did not know or control the specific circumstances in which state and local governments would kill cormorants pursuant to the Order.⁶⁴ Courts have similarly upheld agencies' decisions not to consider the cumulative impacts of a proposed action in combination with other potential future actions on the ground that such future actions are speculative until actually planned.⁶⁵ In each of these types of cases, application of the "remote and speculative" principle substantially limits the agency's burden to address environmental risks and uncertainties.

In addition to the "remote and speculative" principle, courts also limit the scope of NEPA's requirements with respect to environmental risks and uncertainties by application of rules derived from foundational principles of administrative law that mandate deference to reasonably exercised agency judgment. Thus, courts tend to treat disagreements over methodology as a matter requiring deference to agency expertise, even if there is some uncertainty or risk of error in the agency's methodological choices. For example, when the Environmental Protection Agency and the Department of Transportation approved the use of the Longhorn Pipeline to transport gasoline across Texas, the agencies used statistical analysis to predict the risk of pipeline leakage and concluded that the pipeline would not cause

64. See *Fund for Animals v. Kempthorne*, 538 F.3d 124, 137–38 (2d Cir. 2008); see also *City of Shoreacres v. Waterworth*, 332 F. Supp. 2d 992, 1007–08 (S.D. Tex. 2004) (holding that the Army Corps of Engineers, in approving dredging of a shipping channel to a depth of forty-five feet, did not have to analyze the possibility that the channel would later be dredged to a depth of fifty feet). In many such cases, such as where an agency approves a project in multiple phases, the further future actions will trigger additional NEPA analysis. See, e.g., *id.* In some cases, however, such as where state or local governments will take more specific implementing actions without additional federal approval, those further actions may fall outside of NEPA's ambit. See, e.g., *Fund for Animals*, 538 F.3d at 137–38.

65. See, e.g., *Kleppe v. Sierra Club*, 427 U.S. 390, 410 n.20 (1976) (noting that NEPA "speaks solely in terms of *proposed* actions; it does not require an agency to consider the possible environmental impacts of less imminent actions when preparing the impact statement on proposed actions"); *O'Reilly v. U.S. Army Corps of Eng'rs*, 477 F.3d 225, 236–38 (5th Cir. 2007) (holding that NEPA did not require the Army Corps of Engineers to limit its NEPA analysis to Phase I of a proposed residential subdivision because the Corps' approval of Phase I did not obligate it to approve future phases); *City of Riverview v. Surface Transp. Bd.*, 398 F.3d 434, 442 (6th Cir. 2005) (holding that NEPA did not require the Surface Transportation Board, before approving a new intermodal transportation facility, to assess the environmental impact of adding river barge service to the terminal in the future because, although river barge service was "a long-range possibility," the facility operator "had not developed specific plans" for such service).

significant environmental impacts.⁶⁶ The Fifth Circuit rejected the plaintiffs' challenge to the agencies' analysis and conclusion on the ground that "it was not unreasonable."⁶⁷ Such cases, by treating methodological uncertainties as subsumed by the deferential standard of review, effectively absolve agencies of an obligation to assess certain environmental risks they regard as unlikely but that may be the source of significant uncertainty about the environmental impacts of an agency's proposed action. Other courts encountering similar arguments, however, treat disagreements over methodology as questions of uncertainty, and rely on NEPA's "hard look" mandate to require the agency to discuss the shortcomings of its chosen methodology.⁶⁸

These patterns illustrate an overall incoherence in how courts are confronting issues of risk and uncertainty in NEPA cases. Without a clear and common framework for addressing issues of risk and uncertainty, courts are reaching different results in similar cases based on which doctrinal principles they emphasize—for example, NEPA's "hard look" versus the Administrative Procedure Act's (APA) deferential standard of review. Even where courts are relying on a common doctrine—for example, the "remote and speculative" principle—they are applying it in a variety of ways that are conceptually diverse and undertheorized, and as a result susceptible to results-driven reasoning.⁶⁹ Because NEPA cases tend to be written with fact-intensive and case-specific analysis, the holdings and principles announced and applied in these individual decisions do not necessarily

66. See *Spiller v. White*, 352 F.3d 235, 244 (5th Cir. 2003).

67. *Id.* (noting that the plaintiffs' criticisms of the lead agencies' methodology presented "a classic battle of the experts" which requires deference to the agencies' "expert judgment"); see, e.g., *Sierra Club v. Marita*, 46 F.3d 606, 621–24 (7th Cir. 1995) (upholding agencies' methodology because "conflicting scientific evidence" dictated deference to agency judgment); *Or. Env'tl. Council v. Kunzman*, 817 F.2d 484 (9th Cir. 1987).

68. See *Lands Council v. Powell*, 395 F.3d 1019, 1032 (9th Cir. 2005) (holding that the Forest Service violated NEPA by not disclosing its methodology's shortcomings), *overruled in part* by *Lands Council v. McNair*, 537 F.3d 981, 1001 (9th Cir. 2008) (holding that the Forest Service need not "affirmatively present every uncertainty" in its methodology, but rather "must acknowledge and respond to comments by outside parties that raise significant scientific uncertainties and reasonably support that such uncertainties exist").

69. For example, one plausible explanation for the differing results between *San Luis Obispo Mothers for Peace v. Nuclear Regulatory Commission*, 449 F.3d 1016 (9th Cir. 2006) (holding that NEPA requires the NRC to consider the environmental effects of a terrorist attack on a nuclear energy facility), and *New Jersey Department of Environmental Protection v. Nuclear Regulatory Commission*, 561 F.3d 132 (3d Cir. 2008) (holding that NEPA does not require the Nuclear Regulatory Commission to consider the environmental effects of a terrorist attack on a nuclear energy facility), is that the Ninth Circuit panel was more concerned than the Third Circuit panel about the possibility of a terrorist attack on a nuclear energy facility.

conflict, but they do reveal an unfortunately fragmented and uncoordinated approach to an important and recurring issue in NEPA law.

Thus, forty years after Congress enacted NEPA and twenty-five years after CEQ rescinded its worst-case regulation, confusion persists about how agencies are to analyze environmental risks and uncertainties.⁷⁰ The question has received renewed and heightened attention in the wake of two recent environmental catastrophes—the Deepwater Horizon oil spill in the Gulf of Mexico and the meltdowns at the Fukushima Daiichi nuclear reactors in Japan—both of which revealed inadequacies in planning for risks regarded *ex ante* as highly unlikely.⁷¹ In light of these recent events, respected scholars have proposed reinstating CEQ’s rescinded worst-case regulation.⁷² But although the oil spill and the nuclear disaster have refocused attention on worst-case environmental planning, the problem is one that has persisted throughout NEPA’s history without a satisfying or clear resolution.⁷³

III. COMPLICATING FACTORS

Resurgent calls for incorporating worst-case analysis into NEPA appear to be based on an idealized view of environmental planning in the face of uncertainties. This Part identifies three complicating factors that impair the effectiveness of existing NEPA doctrine but also pose daunting

70. See, e.g., Daniel A. Farber, *Confronting Uncertainty under NEPA*, ISSUES IN LEGAL SCHOLARSHIP, no. 3, 2009, at 1, 7, available at <http://www.bepress.com/ils/vol8/iss3/art3> (“There seems to be no clear guidance about when a potential risk becomes so significant that it must be acknowledged in the impact statement.”).

71. See, e.g., NAT’L COMM’N ON THE BP DEEPWATER HORIZON OIL SPILL & OFFSHORE DRILLING, *DEEP WATER: THE GULF OIL DISASTER AND THE FUTURE OF OFFSHORE DRILLING* 122–27 (2011) (identifying industry and regulatory processes that failed to manage risks of catastrophic blowout at BP’s deep water Macondo well); Phred Dvorak & Peter Landers, *Japanese Plant Had Barebones Risk Plan*, WALL ST. J., Mar. 31, 2011, at A1 (noting that Fukushima Daiichi’s report on its accident-management protocols stated that “[t]he possibility of a severe accident occurring is so small that from an engineering standpoint, it is practically unthinkable”); Norimitsu Onishi, *‘Safety Myth’ Left Japan Ripe for Nuclear Crisis*, N.Y. TIMES, June 25, 2011, at A1 (“Because of this widespread belief in Japanese plants’ absolute safety, plant operators and nuclear regulators failed to adopt proper safety measures and advances in technology, like emergency robots, experts and government officials acknowledge.”).

72. See, e.g., Doremus, *supra* note 9 (“CEQ . . . should go back to its original worst-case analysis requirement. Without it, we now know, federal decisions will ignore some major and altogether foreseeable risks.”); McAllister, *supra* note 9 (arguing that “our decision-making processes must identify and analyze worst case scenarios” because the Deepwater Horizon oil spill and the Fukushima Daiichi meltdowns show that “worst case scenarios really can happen”).

73. Cf. Farber, *supra* note 70, at 21 (noting that “the problem of how to handle potentially catastrophic risks has vexed the courts”).

obstacles to implementing a rule requiring agencies to include worst-case analyses in their NEPA documents. These factors necessitate an approach to environmental risks and uncertainties that is contextual and analytically focused.

A. Defining Significance

One of the attractive features of a rule requiring worst-case analysis is that it appears to provide clear guidance for addressing risks and uncertainties, which would represent a marked improvement from the confusion of current NEPA law. But although worst-case analysis sounds clear, it is not. In fact, it is impossible to establish any clear rule for addressing risks in environmental planning because of a conundrum: not all risks are worth examining, but it is difficult to distinguish those risks worth examining from those that are not.

Everyone who has grappled with low-probability risks ultimately realizes that some risks simply do not warrant evaluation. The overwhelming majority of the world's population continued about its daily routine on September 23, 2011, for example, despite the imminent but miniscule risk of being hit by a falling NASA satellite.⁷⁴ The trick, then, is how to define what distinguishes a risk worth examining from a risk not worth examining. That distinction defies simple or clear definition, and thereby dooms the possibility of a bright-line rule for addressing risks.⁷⁵ The significance of a risk depends on the context-specific balance of a variety of factors that cannot be reduced to a simple rule.⁷⁶

Worst-case scenarios are defined only by the severity of the risk—how bad the outcome will be if the risk eventuates. Requiring examination of a risk solely on the basis that it constitutes the “worst case” thus ignores other parameters such as the magnitude of the risk—the probability that the risk will eventuate. Thus, taken literally, a rule requiring analysis of worst-case scenarios is premised on the proposition that a risk warrants consideration because of its severity, regardless of any other factors.

Such a proposition does not withstand scrutiny. In some situations, the worst-case scenario may pose a significant risk that warrants examination. But even where the worst-case scenario threatens horrendously catastrophic

74. See Kenneth Chang, *Satellite's Fall Becomes Phenomenon*, N.Y. TIMES, Sept. 23, 2011, at A22 (noting that the risk to any particular person from the falling satellite was “on the order of 1-in-trillions”).

75. Worst-case analysis is, at least on its face, a bright-line rule for addressing risks because it purports to specify precisely which outcome—the most severe outcome—the agency should consider.

76. Cf. Jeffrie Minier, *Conjunctive Management of Stream-Aquifer Water Rights; The Hubbard Decision*, 38 NAT. RESOURCES J. 651, 662 (1998) (“‘Significant’ is not an absolute characteristic; it is chosen by the user.”).

harm, other factors, such as the probability or the uncertainty of the risk, matter. There is some possibility, for example, that the Large Hadron Collider outside Geneva, Switzerland, could produce a black hole or other catastrophic reaction that would destroy the Earth.⁷⁷ Most nuclear physicists, however, have concluded that such an outcome is so unlikely that the risk can be dismissed as insignificant despite the cataclysmic severity of the consequence if the risk were to eventuate.⁷⁸

The Large Hadron Collider example aptly illustrates a fundamental shortcoming of worst-case analysis. Either worst-case analysis requires a focus on scenarios so extremely unlikely that most would regard them as insignificant, or it requires consideration of factors other than the severity of the risk. In other words, worst-case analysis in practice is either unrealistic and misguided, or means something different—more complicated and less clear—than it facially suggests.

Recognizing that “worst case” provides a poor measure of the overall significance of a risk, efforts have been made to state a rule delineating which risks should be addressed in environmental planning and which can be omitted. The predominant view is that agencies need only consider low-probability risks if they are credible and involve catastrophic consequences. CEQ’s successor regulation to the worst-case scenario requirement uses these criteria, providing that agencies should analyze “impacts which have catastrophic consequences, even if their probability of occurrence is low, provided that the analysis of the impacts is supported by credible scientific evidence, is not based on pure conjecture, and is within the rule of reason.”⁷⁹ Prominent commentators have expressed support for limiting agencies’ obligations with respect to low-probability risks to those that are credible and involve catastrophic consequences.⁸⁰ But neither credibility nor

77. See Dennis Overbye, *Gauging a Collider’s Odds of Creating a Black Hole*, N.Y. TIMES, Apr. 15, 2008, at F2.

78. See, e.g., John Ellis et al., *Review of the Safety of LHC Collisions*, J. PHYSICS G: NUCLEAR & PARTICLE PHYSICS, Nov. 2008, at 1, 2, 3, 12, 17 (2008) (concluding there is “no basis for any conceivable threat” from the Large Hadron Collider); Steven B. Giddings & Michelangelo L. Mangano, *Astrophysical Implications of Hypothetical Stable TeV-Scale Black Holes*, 78 PHYSICAL REV. D, no. 3, 2008, at 035009-1, 035009-27, available at <http://cdsweb.cern.ch/record/1111084/files/PhysRevD.78.035009.pdf> (studying the potential creation of black holes within a Large Hadron Collider and concluding that “there is no risk of any significance whatsoever from such black holes”).

79. 40 C.F.R. § 1502.22(b) (2011).

80. See, e.g., Holly Doremus, *Through Another’s Eyes: Getting the Benefit of Outside Perspectives in Environmental Review*, 38 B.C. ENVTL. AFF. L. REV. 247, 275 (2011) (“Worst-case analysis need not be required for every project; it is important only when there is an uncertain or low probability risk of a disastrous event, like an oil well blowout or a successful terrorist attack on a nuclear installation.”); Farber, *supra* note 70, at 31 (“[T]he agency should consider catastrophic outcomes whenever there is a credible argument that they are possible.”).

catastrophic severity provides an appropriate threshold for the significance of a risk.

Credibility addresses only the reliability, not the probability, of the estimated risk. This is a problem because a credible but highly improbable risk may be insignificant. There is, for example, some reliably predicted risk of a catastrophic earthquake in Pennsylvania, but the probability of the risk is so low that we dismiss such a risk as negligible.⁸¹ Thus, the risk of a catastrophic earthquake in areas of very low earthquake risk is credible but insignificant.⁸²

Nor is it clear that agencies should address all risks of catastrophic outcomes or only risks of catastrophic outcomes. Focusing on catastrophic risks is both overinclusive and underinclusive. It is overinclusive in that, as noted,⁸³ some catastrophic outcomes are so improbable that they can be disregarded. It is underinclusive in that there may be other risks that, although not necessarily catastrophic, are widely considered significant—for example, damage to an important historical landmark. Moreover, although some outcomes clearly fall within the definition of catastrophic—the massive oil spill, the nuclear meltdown, the dam failure—many are not so clear. Is the extinction of an obscure species catastrophic? What about the flooding of a popular recreational area? Arguably whether a consequence of an action is catastrophic—or fits any other classification of risks based on severity—depends on diverse factors such as the benefits of the action, whether the consequence could have been avoided, how frequently the consequence occurs, how visible the consequence is, and even the public's subjective evaluation of the likely consequence.⁸⁴ A negligent explosion of a firework that kills 100 people might be considered catastrophic, for example, but a heat wave that kills 100 people might not be.⁸⁵

81. CHARLES K. SCHARNBERGER, EARTHQUAKE HAZARD IN PENNSYLVANIA 14 (2003). For example, an earthquake that rocked the East Coast in August 2011, although unusually large for the region, caused little damage. See Katharine Q. Seelye et al., *Above All Else, Eastern Quake Rattles Nerves*, N.Y. TIMES, Aug. 24, 2011, at A1 (noting “few reports of serious damage” from the magnitude 5.8 quake).

82. It could be that when we say agencies should focus on “credible” environmental risks, we really mean risks of a certain probability as well as reliability. The rule of reason's subsidiary principle that agencies need not examine “speculative” risks may similarly attempt to encompass both probability and reliability. But defining risks worthy of attention by reference to probability poses problems of its own, in that there is no clear threshold for how probable a risk must be to warrant examination.

83. See *supra* text accompanying note 78.

84. Cf. Minier, *supra* note 76, at 662 (“The level of significance is chosen by balancing the benefits of desired ends against the detriments resulting from a wrong decision.”).

85. Environmental disasters that occur after apparently inadequate ex ante attention to the risks of catastrophic harm provide one of the primary impetuses for calls to revive the worst-case requirement under NEPA. Merely pointing to inadequate NEPA documents does not, however, establish that NEPA's current requirements are inadequate or that a

Although the ad hoc approach of existing NEPA law avoids the problems of a bright-line distinction such as worst-case analysis, it too has struggled with defining what risks and uncertainties are significant enough to require discussion. NEPA regulations, by limiting the scope of NEPA to “reasonably foreseeable significant adverse effects on the human environment,”⁸⁶ essentially employ a test of reasonable foreseeability to distinguish between risks that require discussion and risks that do not. This is consistent with other areas of law such as torts and criminal law that widely use the term “reasonably foreseeable” to define those risks for which an actor should be held accountable.⁸⁷

Despite its widespread adoption in the law, however, courts have found that operationalizing reasonable foreseeability is extremely difficult. Efforts to define what risks are reasonably foreseeable generally invoke the notoriously opaque reasonable person standard,⁸⁸ which essentially renders

worst-case analysis requirement would improve environmental planning. Poor environmental planning may well be, and often is, a problem of slippage in compliance rather than inadequate rules. See Daniel A. Farber, *Taking Slippage Seriously: Noncompliance and Creative Compliance in Environmental Law*, 23 HARV. ENVTL. L. REV. 297, 299 (1999) (defining “‘negative’ slippage” as “something that is legally mandated [but] simply fails to happen”). For example, the Clean Water Act requires owners and operators of oil vessels and facilities to prepare response plans that include “a plan for responding, to the maximum extent practicable, to a worst case discharge,” 33 U.S.C. § 1321(j)(5)(A)(i) (2006), but everyone agrees that BP’s worst-case planning fell far short of what the Clean Water Act and its implementing regulations require. See NAT’L COMM’N ON THE BP DEEPWATER HORIZON OIL SPILL & OFFSHORE DRILLING, *supra* note 71, at 84 (concluding that, despite statutory requirements, “neither BP, in crafting its Oil Spill Response Plan for the Gulf of Mexico applicable to the Macondo well, nor [the Minerals Management Service] in approving it, evidenced serious attention to detail”). BP’s shoddy analysis in the face of the Clean Water Act’s worst-case analysis requirement does not support adding such a requirement to NEPA.

86. See 40 C.F.R. § 1502.22 (2011).

87. See, e.g., *Go-Best Assets Ltd. v. Citizens Bank of Mass.*, 947 N.E.2d 581, 593 (Mass. App. 2011) (“The ordinary rule is that a tortfeasor is liable for the reasonably foreseeable consequences of its actions.”); *State v. Bridges*, 628 A.2d 270, 280 (N.J. 1993) (“[A] conspirator can be held liable for the acts of others that constitute a reasonably foreseeable risk arising out of the criminal conduct undertaken to effectuate the conspiracy, and occurring as the necessary or natural consequences of the conspiracy.”); *McKinnon v. United States*, 550 A.2d 915, 918 (D.C. 1988) (“[A] criminal defendant proximately causes, and thus can be held criminally accountable for, all harms that are reasonably foreseeable consequences of his or her actions.”).

88. See, e.g., *City of Carter Lake v. Aetna Cas. & Sur. Co.*, 604 F.2d 1052, 1059 n.4 (8th Cir. 1979) (“A result is reasonably foreseeable if there are indications which would lead a reasonably prudent man to know that the particular results could follow from his acts.”). For criticisms of the “reasonable person” standard, see, for example, Susan M. Mathews, *Title VII and Sexual Harassment: Beyond Damages Control*, 3 YALE J.L. & FEMINISM 299, 313 (1991) (criticizing the “reasonable person” standard as “too ambiguous”); Robert Rubinson, *Constructions of Client Competence and Theories of Practice*, 31 ARIZ. ST. L.J. 121, 126 n.18 (1999) (characterizing the “reasonable person” standard in tort law as context-dependent and “classically difficult to define”).

the reasonably foreseeable standard circular: risks are reasonably foreseeable if they would be foreseen by a reasonable person. Foreseeability itself offers little direction; Prosser and Keeton observed that “the concept of foreseeability so completely lacks all clarity and precision that it amounts to little more than a convenient formula for disposing of a case—usually by leaving it to the jury”⁸⁹ To the extent courts have tried to describe reasonable foreseeability more specifically, their guidance merely demonstrates the muddiness of the waters: a consequence “‘need not have been a strong probability’”⁹⁰ but must be more than “just a remote possibility.”⁹¹

In addition to objective factors that complicate the significance of risk, subjective factors may play an important role as well. Indeed, if the significance of a risk depends even in part on how people actually perceive it, then risk significance becomes even more difficult to assess. Psychologists have found that factors such as voluntariness, controllability, lethality, and fairness affect the significance people assign to risks.⁹² Research also suggests that a person’s cultural worldview affects her perception of risks: “[I]ndividuals select certain risks for attention and disregard others in a way that reflects and reinforces the particular worldviews to which they adhere.”⁹³

The difficulties and complexities encountered when attempting to define what risks and uncertainties are significant, and therefore worthy of discussion under NEPA, mirror difficulties that have arisen in other areas of the law in defining significant risk. For example, the Supreme Court has interpreted the Occupational Safety and Health Act (OSHAct)⁹⁴ to require the Occupational Safety and Health Administration (OSHA), before adopting a standard regulating a toxic material or harmful physical agent, to show that the regulated substance poses a significant risk.⁹⁵ The Court recognized, however, that within broad limits, “[OSHA’s] determination that a particular level of risk is ‘significant’ will be based largely on policy

89. W. PAGE KEETON ET AL., PROSSER AND KEETON ON TORTS 297 (5th ed. 1984).

90. *People v. Nguyen*, 26 Cal. Rptr. 2d 323 (Cal. Ct. App. 1993) (quoting 1 B. E. WITKIN & NORMAN L. EPSTEIN, CALIFORNIA CRIMINAL LAW 150 (2d ed. 1988)).

91. *Tedder v. Raskin*, 728 S.W.2d 343, 348 (Tenn. Ct. App. 1987).

92. Paul Slovic, *What’s Fear Got to Do with It? It’s Affect We Need to Worry About*, 69 MO. L. REV. 971, 976 (2004) (citing Peter Sandman, *Hazard Versus Outrage in the Public Perception of Risk*, in EFFECTIVE RISK COMMUNICATION: THE ROLE AND RESPONSIBILITY OF GOVERNMENT AND NONGOVERNMENT ORGANIZATIONS 45 (Vincent T. Covello et al. eds., 1989)).

93. Dan M. Kahan & Donald Braman, *Cultural Cognition and Public Policy*, 24 YALE L. & POL’Y REV. 149, 154 (2006). For example, a person with an egalitarian viewpoint may be sensitive to environmental risk because environmental regulation restricts commercial activities that produce social inequality. *Id.*

94. 29 U.S.C. §§ 651–678 (2006).

95. *Indus. Union Dep’t v. Am. Petroleum Inst.*, 448 U.S. 607, 639–40 (1980).

considerations.”⁹⁶ As another example, the Americans with Disabilities Act (ADA)⁹⁷ excludes from its protections disabled individuals who pose a “significant risk to the health or safety of others.”⁹⁸ Four factors define significant risk under the ADA: the nature of the risk; the duration of the risk; the severity of the risk; and the probability of the risk.⁹⁹ Thus, both the OSHAct and the ADA use significant risk as an important threshold in defining the scope of the statute, and in both contexts the term significant risk depends on a contextual balancing of multiple factors rather than a bright-line rule.

NEPA analyses should address significant environmental risks and should be allowed to disregard risks that are not significant. As the foregoing discussion in this Section demonstrates, however, the significance of an environmental risk is a judgment that may be a function of several different variables. None of these variables by itself can determine the significance of a risk. It is the mix of the variables in each particular case that is important. These variables include at least the probability of the risk and the severity of the risk if it actualizes.¹⁰⁰ But it may include other variables as well, such as the (un)certainty of the risk. Uncertainty entails incomplete knowledge about characteristics of a risk, such as probability or severity, that may bear on its significance.¹⁰¹ Uncertainty thus essentially adds an additional layer of risk—the risk of erroneous prediction—on top of the risk itself. At a sufficient level, that uncertainty may render the risk significant.

Moreover, each of the variables that determines the significance of a risk is itself complicated. The severity of a risk, for example, is difficult to evaluate and often involves debatable judgments. For example, NEPA regulations identify several factors that influence the intensity or severity of an environmental impact, all of which involve contextual judgments.¹⁰²

96. *Id.* at 655 n.62. The Court opined that a “one in a billion” cancer risk “clearly could not be considered significant,” whereas a “one in a thousand” risk of death would reasonably be considered significant. *Id.* at 655.

97. Americans with Disabilities Act of 1990, Pub. L. No. 101-336, 104 Stat. 327 (codified as amended in scattered sections of 42 U.S.C.).

98. *See, e.g.*, 42 U.S.C. §§ 12111(3), 12113(a)–(b) (2006).

99. *See, e.g.*, *Waddell v. Valley Forge Dental Assocs., Inc.*, 276 F.3d 1275, 1280 (11th Cir. 2001) (quoting *Sch. Bd. of Nassau Cnty. v. Arline*, 480 U.S. 273, 288 (1987)).

100. CASS R. SUNSTEIN, *WORST-CASE SCENARIOS* 120 (2007) (arguing that planning should consider “both the probability and the severity of worst-case scenarios”).

101. *See supra* note 3 (distinguishing risk and uncertainty).

102. The factors include whether the impacts are beneficial or adverse; whether public health or safety is affected; whether the effects involve a geographic area with unique characteristics; the extent to which the effects are likely to be controversial; the extent to which the effects are uncertain; the extent to which the action may establish a precedent for future actions; the extent to which the action is related to other actions that together with the action may have cumulatively significant impacts; the extent to which the action may affect historic or cultural resources; the extent to which the action may adversely affect endangered

The complexity of the considerations that go into determining the significance of a risk necessitates a standard that is both contextual and case specific and allows consideration of multiple factors such as the magnitude, reliability, and severity of the risk.¹⁰³

B. Cabining Risk and Uncertainty

Risks and uncertainty are ubiquitous in environmental planning, making it imperative for agencies to address risks and uncertainty in their NEPA analyses. But the pervasiveness of risks and uncertainty also poses a danger to NEPA implementation, because it means that rules that would increase agencies' responsibilities to address risk and uncertainty have the potential to apply very broadly, and thereby pose a danger of overwhelming agencies and the public alike with large amounts of additional information. Thus, in addition to the obstacles to defining clearly what environmental risks are significant enough to require inclusion in an agency's NEPA analysis,¹⁰⁴ there is also difficulty in cabining risks and uncertainty.

Because of the complexity of both human behavior and ecological systems, risks and uncertainty pervade environmental planning. Virtually every conclusion in an agency's NEPA analysis involves risks, uncertainty, or both.¹⁰⁵ These risks and uncertainties arise because the Earth's ecological systems are fundamentally complex and dynamic.¹⁰⁶ For example, an agency considering a management program for a major river may have to evaluate the possibility that the program could result in temporary drawdowns of a lake in the river system, which could increase the area of shoreline exposed,

species or their habitats; and whether the action threatens a violation of federal, state, or local environmental law. 40 C.F.R. § 1508.27(b) (2011).

103. Cf. *Ethyl Corp. v. EPA*, 541 F.2d 1, 18 n.32 (D.C. Cir. 1976) ("Ultimately, of course, whether a particular combination of slight risk and great harm, or great risk and slight harm, constitutes a danger must depend on the facts of each case."); 1 THOMAS STREET, *THE FOUNDATIONS OF LEGAL LIABILITY* 110 (1906) ("It is unfortunate that no definite principle can be laid down by which to determine this question [of proximate cause]. It is always to be determined on the facts of each case upon mixed considerations of logic, common sense, justice, policy, and precedent."); Paolo F. Ricci & Lawrence S. Molton, *Risk and Benefit in Environmental Law*, 214 *SCIENCE* 1096, 1097 (1981) (observing that the point at which a risk becomes significant "must require case-by-case determination").

104. See *supra* Part III.A.

105. See Karkkainen, *supra* note 24, at 926 (noting that "information about the environmental consequences of our actions is . . . typically scarce, costly to assemble, highly uncertain, and variable in quality"); Bradley C. Karkkainen, *Whither NEPA?*, 12 *N.Y.U. ENVTL. L.J.* 333, 350 (2004) ("[B]ecause ecological processes are complex and typically less than fully understood, [ex ante scientific] predictions [about the environmental consequences of a proposed action] are often highly uncertain."); Dave Owen, *Probabilities, Planning Failures, and Environmental Law*, 84 *TUL. L. REV.* 265, 267 (2009) ("Throughout environmental management, agencies also confront pervasive uncertainties.").

106. RICHARD J. LAZARUS, *THE MAKING OF ENVIRONMENTAL LAW* 6 (2004).

which could cause sediments from the exposed shoreline to dry out and become airborne through wind action, which, if the sediments are contaminated and if they are inhaled by humans, could pose a hazard to human health.¹⁰⁷ In addition, environmental consequences often depend on patterns of human behavior that are difficult to predict. For example, an agency approving funds for a new highway may have to evaluate the possibility that the new road will induce residential and industrial growth, which may in turn increase demands on local sewage treatment facilities.¹⁰⁸ An agency approving construction of an updated airport terminal may have to predict what effect, if any, the new terminal will have on airport use years into the future.¹⁰⁹

Given the pervasiveness of risks and uncertainties, each of which requires a judgment or assumption about how it ought to be addressed, a worst-case analysis would quickly spiral out of control as judgment piled upon judgment upon judgment. More broadly, the pervasiveness of risks and uncertainty renders the option of complete analysis and transparency with respect to risk and uncertainty practically unattainable. Thus, agencies cannot be required to disclose and discuss every possibility and uncertainty in their analyses. Such a practice would swamp NEPA documents with overwhelming detail and dramatically increase the costs of NEPA compliance, which are already often criticized as excessive.¹¹⁰ It also would drown the public in far more information than it could feasibly absorb in any meaningful way.¹¹¹

107. 1 WASH. STATE DEP'T OF ECOLOGY, FINAL PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT FOR THE COLUMBIA RIVER WATER MANAGEMENT PROGRAM 5-2 to 5-3 (2007).

108. *City of Davis v. Coleman*, 521 F.2d 661, 676–77 (9th Cir. 1975).

109. *City of Los Angeles v. FAA*, 138 F.3d 806, 807–08 (9th Cir. 1998).

110. See, e.g., TASK FORCE ON IMPROVING THE NAT'L ENVTL. POLICY ACT, RECOMMENDATIONS TO IMPROVE AND UPDATE THE NATIONAL ENVIRONMENTAL POLICY ACT 12–13 (2006); Karkkainen, *supra* note 105, at 340–41.

111. In an analogous context, commentators have noted the danger that including too much information on a product-warning label or in doctors' disclosures of risks to patients can overwhelm the consumer or patient, undermining the purpose of the warning or disclosure. See, e.g., Alan Meisel, *From Tragedy to Catastrophe: Lawyers and the Bureaucratization of Informed Consent*, 6 YALE J. HEALTH POL'Y L. & ETHICS 479, 482 (2006) (“[I]nformed consent can become an exercise in ‘information dumping.’ Overload the patient with information, thereby complying with the letter of the law but undermining the idea of informed consent.”); Martha Minow, *Telling Medical Stories: Sharing Information Among Doctors, Patients, and Families*, 1992 UTAH L. REV. 903, 920 (1992) (“It is possible that physicians at times may tell too much information . . . [F]ull disclosure of information—complete with probabilities and uncertainties—may engender no increased sense of control for patients.”); W. Kip Viscusi, *Individual Rationality, Hazard Warnings, and the Foundations of Tort Law*, 48 RUTGERS L. REV. 625, 665 (1995) (“[T]here is a potential danger of information overload from the increase in the amount of information and the diversity of risks included in the warning.”).

Increasing the informational burden on agencies to address risks and uncertainty in their NEPA analyses should be of particular concern because there is already widespread agreement that increasing the amount of information in EISs and Environmental Assessments does not necessarily improve them, and in fact often makes them less effective.¹¹² There is a difference between forcing agencies to discuss a point and actually inducing agencies to engage critically with an issue, and NEPA succeeds more at the former than the latter. Indeed, criticisms are often heard that NEPA analyses are merely prepared to defend against litigation¹¹³ and that NEPA does little more than increase the transaction costs for agency action.¹¹⁴ Even if overstated, these criticisms highlight the need for an approach to risks and uncertainties that produces information of a type and in a form that effectuates NEPA's purposes.

NEPA case law currently balances requirements that agencies disclose risks and uncertainties with the need to avoid excessive discussion, but it is not clear that the existing balance is either stable or reasoned. As explained in Part II, NEPA cases address issues of risk and uncertainty with an uneasy and arguably incoherent mix of competing doctrines. On the one hand, courts can invoke NEPA's "hard look" mandate and CEQ's regulations to require agencies to disclose the uncertainties associated with the agency's

112. See, e.g., Flournoy et al., *supra* note 28, at 1582–83 (noting that NEPA case law has tended to "encourage agencies to gold-plate their EISs by including every conceivably relevant piece of information to avoid reversal," resulting in "overly lengthy documents that are less valuable than more concise, focused documents would be").

113. See, e.g., Jamison E. Colburn, *The Cynic at the Circus*, 45 TULSA L. REV. 307, 323 n.135 (2009) ("NEPA arguably encourages agencies to 'bullet proof' their NEPA documents in anticipation of litigation, not necessarily to improve their predictive capacities."); Michael Herz, *Parallel Universes: NEPA Lessons for the New Property*, 93 COLUM. L. REV. 1668, 1700 (1993) ("EISs are crammed with long, often boilerplate, discussions that are not meaningfully informative but are included mainly as a defense against subsequent litigation."); David C. Shilton, *Is the Supreme Court Hostile to NEPA? Some Possible Explanations for a 12–0 Record*, 20 ENVTL. L. 551, 567 (1990) ("EISs prepared in anticipation of litigation tend to be uncreative and merely defensible rather than environmentally sound, which frustrates NEPA.").

114. See, e.g., Karkkainen, *supra* note 105, at 341 ("[T]he EIS process is by its very nature so inefficient and cumbersome that it may be used to thwart or constrain agency decision-making through selective, tactical application of extreme transaction costs."); David B. Spence, *Administrative Law and Agency Policy-Making: Rethinking the Positive Theory of Political Control*, 14 YALE J. ON REG. 407, 425 n.72 (1997) ("NEPA is generally understood to have had little substantive effect on agency decisions, except for the increased transaction costs due to NEPA compliance that may effectively kill marginal agency projects."). *But see* Jason J. Czarnecki, *Revisiting the Tense Relationship Between the U.S. Supreme Court, Administrative Procedure, and the National Environmental Policy Act*, 25 STAN. ENVTL. L.J. 3, 27 n.124 (2005) (questioning "whether explanation in the NEPA process results in the same 'ossifying' concerns as in the informal rulemaking context").

prediction of impacts.¹¹⁵ On the other hand, courts can defer to the agency's reasonable judgment in the face of uncertainty, citing rules derived from foundational principles of administrative law that mandate deference to reasonably exercised agency judgment.¹¹⁶ These coexisting but conflicting principles achieve a workable balance between requiring discussion of risks and uncertainties and not overburdening agencies, but it is an ad hoc and haphazard balance because few cases attempt to reconcile the conflicting principles in any kind of thoughtful way.

C. Counteracting Biases

The two problems discussed so far—the difficulty in defining what risks are significant enough to warrant discussion and the difficulty in cabining risks and uncertainties—present conceptual obstacles to creating a clear legal rule for how agencies should consider risks and uncertainties in their NEPA analyses. These obstacles have important practical consequences for environmental planning, but at their root they arise from conceptual problems. Risks and uncertainties also present difficulties that are more directly practical, derived from the unavoidable biases of the actors involved.

Two discrete but interrelated factors create these biases. First, agencies and interested members of the public have predispositions toward favoring or opposing projects. These predispositions give them strong incentives to use information about a proposed action's environmental consequences for strategic advantage in marshaling public support or opposition to the project and in preparing for litigation about the project.¹¹⁷ Such effects create intentional biases in the information produced and disseminated about proposed agency actions. Second, psychological factors lead both agencies and interested members of the public to process information about a proposed action differently from what one would expect of perfectly rational actors. Such effects create unintentional biases in the information available about a project. Together, these intentional and unintentional biases limit the ability and willingness of agencies and the public to engage constructively on low-probability risks such as worst-case scenarios. These biases

115. See *Neighbors of Cuddy Mountain v. U.S. Forest Serv.*, 137 F.3d 1372, 1380 (9th Cir. 1998); 40 C.F.R. § 1502.22 (2010).

116. See *supra* note 66-68 and accompanying text.

117. See, e.g., Dick Carter, *West Bear Rises Again*, HIGH UINTAS PRES. COUNCIL (High Uintas Pres. Council, Hyrum, U.T.), Sept. 2008, available at <http://www.hupc.org/Archive/newsletters/September%202008/westbeara.htm> (using information from an EIS to rally opposition to a proposed timber sale); *Mary River Mine: Another Challenge to Walrus Habitat*, WORLD WIDE WALRUS WEB (Apr. 18, 2011), <http://www.worldwidewalrusweb.com/tag/baffin-island/> (using information from an EIS to rally opposition to a proposed mining project).

also suggest that worst-case analysis and other proposals that would merely require additional information disclosure are unlikely to effectuate NEPA's goal of promoting informed decision making. Instead, NEPA needs to focus on counteracting agency and public biases more directly.

1. Agency Biases

A variety of factors may influence an administrative agency considering a proposed project to underestimate or underweight, either intentionally or unintentionally, the possibility that the action will result in an adverse environmental consequence. These factors are particularly acute for analyses with significant levels of risk and uncertainty, where the consequences of a proposed action are unclear. Together, these factors make it difficult to induce agencies to examine and to disclose in full the risks and uncertainties associated with a proposed action.

First, an agency may in bad faith attempt to garner support for and undermine opposition to a favored proposed action by understating or not discussing the risk of an adverse environmental consequence from the action. Complaints of agency bad faith are common, although not often successfully proven, in NEPA cases.¹¹⁸ Agencies undoubtedly face some incentive to understate environmental risks. An agency may purposefully downplay the possibility of an adverse environmental impact to avoid negative publicity or having to confront adverse consequences of its preferred course of action. NEPA's focus on *ex ante* predictions, and lack of continuing verification or monitoring of the accuracy of those predictions,¹¹⁹ increases the incentive for optimistic forecasting. Agencies' incentives to understate risks and uncertainties are especially strong for actions that are unlikely to lead to litigation, and therefore judicial scrutiny. Even when litigation is possible or likely, the deferential standards of judicial review that govern in administrative law cases may give agencies reason to believe that their NEPA analyses will not be overturned despite neglecting some possible environmental harms. Areas of uncertainty create especially attractive opportunities for concealing risks of adverse consequences, because judgments in the face of uncertainty are a type of agency decision to which courts generally defer.¹²⁰

118. See, e.g., *Silverton Snowmobile Club v. U.S. Forest Serv.*, 433 F.3d 772, 780–81 (10th Cir. 2006); *Wildlaw v. U.S. Forest Serv.*, 471 F. Supp. 2d 1221, 1261 (M.D. Ala. 2007); *Australians for Animals v. Evans*, 301 F. Supp. 2d 1114, 1127 (N.D. Cal. 2004).

119. *Karkkainen*, *supra* note 105, at 344 (noting that NEPA requirements are “purely predictive in character” and that “[t]he emphasis is not on actual impacts, but on predicted impacts”).

120. See, e.g., *Rural Cellular Ass'n v. FCC*, 588 F.3d 1095, 1105 (D.C. Cir. 2009) (“The ‘arbitrary and capricious’ standard is particularly deferential in matters implicating predictive judgments and interim regulations.”); *Marita*, 46 F.3d at 623 (upholding agencies’

Second, all of the traditional concerns about agency bias against the general public interest,¹²¹ such as the agency capture thesis,¹²² would support the hypothesis that agencies tend to downplay the adverse environmental impacts of their proposed actions to avoid stimulating public opposition to favored policies. Indeed, NEPA itself seems to some extent to “assume[] as inevitable an institutional bias within an agency proposing a project,” and to reduce such bias requires agencies to conduct their NEPA analyses before reaching a decision on a project.¹²³ The idea that agencies will shirk their NEPA responsibilities when they are able is consistent with critiques of NEPA contending that, because NEPA has been interpreted as procedural rather than substantive, agencies treat their NEPA analyses as window dressing without truly integrating environmental concerns into their decision-making processes.¹²⁴

Despite the incentives and opportunities for intentional bias, one would hope and expect that agencies generally act in good faith, consistent with the well-established presumption that public officials will properly

methodology because “‘conflicting scientific evidence’” created uncertainty and made judicial deference to agency methodology appropriate); *New York v. Reilly*, 969 F.2d 1147, 1150–51 (D.C. Cir. 1992) (“We are particularly deferential when reviewing agency actions involving policy decisions based on uncertain technical information.”).

121. John M. Golden, *Patentable Subject Matter and Institutional Choice*, 89 TEX. L. REV. 1041, 1044 (2011) (“Of course, with any administrative agency, there are the usual concerns of capture and bias.”).

122. The agency capture thesis posits that a regulatory agency “becomes closely identified with and dependent upon the industry it is charged with regulating.” Thomas W. Merrill, *Capture Theory and the Courts: 1967–1983*, 72 CHI.-KENT L. REV. 1039, 1060 (1997) (reviewing the historical development of academic literature supporting the agency capture thesis); see also Rachel E. Barkow, *Insulating Agencies: Avoiding Capture Through Institutional Design*, 89 TEX. L. REV. 15, 22–24 (2010) (citing reasons that contribute to agency capture); Richard B. Stewart, *The Reformation of American Administrative Law*, 88 HARV. L. REV. 1667, 1713 (1975) (“It has become widely accepted, not only by public interest lawyers, but by academic critics, legislators, judges, and even by some agency members, that the comparative overrepresentation of regulated or client interests in the process of agency decision results in a persistent policy bias in favor of these interests.” (footnotes omitted)).

123. See *Metcalf v. Daley*, 214 F.3d 1135, 1142 (9th Cir. 2000) (quoting *Envtl. Def. Fund, Inc. v. Corps of Eng’rs of the U.S. Army*, 470 F.2d 289, 295 (8th Cir. 1972)).

124. See, e.g., Philip Michael Ferester, *Revitalizing the National Environmental Policy Act: Substantive Law Adaptations from NEPA’s Progeny*, 16 HARV. ENVTL. L. REV. 207, 229 (1992) (contending that “the erosion of NEPA’s substantive foundation has caused once-sound procedures to become ineffective”); Karkkainen, *supra* note 24, at 906 n.10 (noting the common critique “that NEPA is ineffective because it lacked substantive bite from the outset”); Erin C. Perkins, Comment, *Migratory Birds and Multiple-Use Management: Using the Migratory Bird Treaty Act to Rejuvenate America’s National Environmental Policy*, 92 NW. U. L. REV. 817, 839 (1998) (contending that NEPA has become a “mere procedural weapon[] that federal agencies like the Forest Service have learned to manipulate in order to evade the pro-conservation policy initially codified by Congress”); *The National Environmental Policy Act 40th Anniversary Symposium*, *supra* note 24, at 11,195 (transcribing an unidentified audience member’s comment that “NEPA is procedural, it is in many instances window-dressing”).

discharge their official duties.¹²⁵ But good faith is not the same as lack of bias, and good faith does not guarantee compliance with applicable requirements. Several factors may induce bias in agencies that leads them, despite acting in good faith to implement NEPA, to downplay environmental risks.

For most agencies, environmental protection is but one of many goals Congress has charged the agency with pursuing.¹²⁶ Indeed, environmental protection is often a secondary goal, perceived to be at odds with the agency's other, primary goals.¹²⁷ Such situations create a strong incentive for agencies to take an optimistic view of the environmental consequences of a proposed project, thereby avoiding or reducing the conflict between environmental protection and other goals.¹²⁸ Denying or downplaying the possibility of an adverse environmental outcome allows the agency to pursue its other goals with fewer constraints.¹²⁹ Optimism avoids the dilemma posed by a tradeoff.

Moreover, making environmental protection a substantive goal may have the counterintuitive consequence of making agencies more likely to underestimate the possibility of adverse environmental consequences. Designating environmental protection as a goal means that adverse environmental impacts become a form of project failure. It is human nature to believe in, and indeed to place excessive confidence in, one's likelihood of

125. See *FCC v. Schreiber*, 381 U.S. 279, 296 (1965); *Lewis v. United States*, 279 U.S. 63, 73 (1929); *United States v. Chem. Found.*, 272 U.S. 1, 14–15 (1926). This presumption can only be overcome by clear evidence and an affirmative showing that the public official acted improperly. *Lewis*, 279 U.S. at 73; *Chem. Found.*, 272 U.S. at 14–15.

126. See Biber, *supra* note 25, at 7–9 (noting “[t]he [u]biquity of [m]ultiple-[g]oal [a]gencies”).

127. *Cf. id.* at 6–30 (describing the tendency of multiple-goal agencies to focus on certain primary goals at the expense of secondary goals).

128. *Cf. Natural Res. Def. Council, Inc. v. SEC*, 606 F.2d 1031, 1048 (D.C. Cir. 1979) (noting the need for “particularly stringent review of procedural compliance with NEPA . . . when the agency involved does not include environmental protection within its primary mission”).

129. For example, the Army Corps of Engineers recently approved the dredging of millions of tons of sand and gravel from the Missouri River for commercial use. U.S. ARMY CORPS OF ENG'RS, RECORD OF DECISION FOR AUTHORIZATION OF COMMERCIAL SAND AND GRAVEL DREDGING ON THE LOWER MISSOURI RIVER (2011), available at http://www.nwk.usace.army.mil/regulatory/Dredging/MO/ROD2011/ROD_31Mar2011.pdf. The Corps' EIS concluded that the project could proceed “while keeping the risk of future [river] bed degradation to a minor or slight level,” a finding that freed the Corps to approve the dredging while still certifying its compliance with environmental standards. U.S. ARMY CORPS OF ENG'RS, MISSOURI RIVER COMMERCIAL DREDGING FINAL ENVIRONMENTAL IMPACT STATEMENT, at ES-6 (2011), available at http://www.nwk.usace.army.mil/regulatory/Dredging/MO/FEIS2011/FEIS00.02_Summary.pdf. Even if the Corps' prediction of the environmental impacts was accurate, the Corps clearly faced an incentive to conclude that the environmental impacts would be slight.

success.¹³⁰ People believe, for example, that they are less likely than others to be affected by a risk.¹³¹ This optimism bias is stronger for low-probability hazards and hazards thought to be controllable,¹³² both characteristics that apply to many environmental risks. Indeed, research shows that people approach environmental risks with “tremendous wishful thinking.”¹³³ Agencies operating with a goal to mitigate environmentally harmful consequences therefore are likely to discount the possibility that they will cause such adverse environmental impacts, because to cause them would be to fail.

Agencies also may act with excessive optimism where environmental risks have not eventuated from similar previous decisions. People judge the likelihood of an event based on how easy it is to imagine or recall, which can lead them to underestimate the risk of an event that has not occurred but may occur (known as the *availability heuristic*).¹³⁴ Accordingly, where prior agency actions have not resulted in an adverse environmental consequence, agency staff is likely to downplay the possibility that the risk of the consequence will eventuate for a similar future action.

2. Public Bias

Just as it would be naïve to assume that agencies act impartially with regard to their proposed actions, the public, too, is often far from neutral in its response. In particular, major agency decisions often evoke strong responses from the public either in support of or in opposition to a proposed action. Those who support a proposed action may consider NEPA a source of unnecessary delay and an annoying procedural hurdle. For those who oppose a proposed action, NEPA presents an important opportunity to raise questions and generate information about the possible adverse

130. See, e.g., Dan Lovallo & Daniel Kahneman, *Delusions of Success: How Optimism Undermines Executives' Decisions*, HARV. BUS. REV., July–Aug. 2003, at 56 (noting that “the tendency toward optimism is unavoidable”).

131. PAUL SLOVIC, THE PERCEPTION OF RISK 366 (2000); Neil D. Weinstein, *Optimistic Biases About Personal Risks*, 246 SCIENCE 1232, 1232 (1989); Neil D. Weinstein & William M. Klein, *Resistance of Personal Risk Perceptions to Debiasing Interventions*, 14 HEALTH PSYCHOL. 132, 132 (1995).

132. Weinstein, *Optimistic Biases About Personal Risks*, *supra* note 131, at 1232.

133. Barton H. Thompson, Jr., *Tragically Difficult: The Obstacles to Governing the Commons*, 30 ENVTL. L. 241, 258–59 (2000); see also *id.* at 264 (noting that “most people assume that they will be able to avoid, reduce, or ameliorate future risks”).

134. Paul Slovic et al., *Facts Versus Fears: Understanding Perceived Risk*, in JUDGMENT UNDER UNCERTAINTY: HEURISTICS AND BIASES 463, 465 (Daniel Kahneman et al. eds., 1982); SUNSTEIN, *supra* note 100, at 54–60; Amos Tversky & Daniel Kahneman, *Availability: A Heuristic for Judging Frequency and Probability*, in JUDGMENT UNDER UNCERTAINTY, *supra*, at 163, 163–64.

consequences of a project for which the publicity may otherwise be overwhelmingly favorable—actions that effectuate NEPA's purposes.

But NEPA also presents an opportunity for opponents “to throw up procedural roadblocks” and “to raise the financial and political costs of projects they oppose and stretch out decisions over an extended time frame, giving time to rally political opposition” and sometimes generating enough costs “to derail the project entirely.”¹³⁵ When project opponents use NEPA in this manner, they turn it into a “tool of unprincipled obstructionism.”¹³⁶

Environmental risks often are a source of both genuine anxiety and political opportunity for project opponents. For all the reasons discussed above, project opponents may distrust agencies' evaluation of the environmental risks of a proposed project. Project opponents may believe that the agency is deliberately or negligently understating significant risks of adverse consequences from its proposed action. Countering what they perceive as misinformation from the agency is accordingly often a high priority for project opponents.¹³⁷ Moreover, highlighting a severe possible consequence can be a powerful persuasive tool to rally public opposition, even if the risk of the consequence is quite low.¹³⁸

The psychology of risk perception is such that the line between honest fears and cynical manipulation of environmental risks is not as clear as it first seems. Psychological research has found that “responses to uncertain situations appear to have an all-or-none characteristic that is sensitive to the *possibility* rather than the *probability* of strong positive or negative

135. Karkkainen, *supra* note 105, at 339–40. Karkkainen terms the project opponent who uses NEPA for this purpose the “NEPA monkey wrencher.” *Id.* at 339.

136. *Id.* at 341. *See generally id.* at 340–41 (noting that, “[w]hen used in this way, NEPA is largely a negative weapon—an obstructionist tool” and that “the EIS process is by its very nature so inefficient and cumbersome that it may be used to thwart or constrain agency decision-making through selective, tactical application of extreme transaction costs”).

137. *See, e.g.,* OCEAN MAMMAL INST., WHY THE NAVY'S CONCLUSIONS ABOUT THE SAFETY OF LFAS ARE SCIENTIFICALLY FLAWED (2001), available at <http://www.oceanmammalinst.com/navyconclusionsflawed.html> (detailing the Institute's allegations that “[t]he scientific reasoning behind the Navy's conclusions in their EIS . . . that Low Frequency Active Sonar (LFAS) is safe are scientifically flawed”).

138. For example, opponents of the Department of Energy's planned repository for spent nuclear fuel at Yucca Mountain in Nevada attempted to foment opposition to the facility by, among other things, highlighting catastrophic accidents that could occur in transporting the fuel by rail to Nevada. *See 'Glow Train' Goes National*, LAS VEGAS SUN (June 29, 2008, 2:10 AM), <http://www.lasvegassun.com/news/2008/jun/29/glow-train-goes-national/>. The Department of Energy's risk analysis concluded that even a highly unlikely severe rail accident involving transportation casks of spent nuclear fuel—an accident involving a “long duration, high-temperature fire that would engulf a cask”—would pose only very low health risks. U.S. DEPT. OF ENERGY, OFFICE OF CIVILIAN RADIOACTIVE WASTE MGMT., FINAL ENVIRONMENTAL IMPACT STATEMENT FOR A RAIL ALIGNMENT FOR THE CONSTRUCTION AND OPERATION OF A RAILROAD IN NEVADA TO A GEOLOGIC REPOSITORY AT YUCCA MOUNTAIN, NYE COUNTY, NEVADA 4-342 to 4-344 (2008).

consequences, causing very small probabilities to carry great weight.”¹³⁹ Scholars call this effect *probability neglect*.¹⁴⁰

Whether motivated by an honest belief that risks are more serious than what the agency acknowledges or by a cynical decision to lob any available critique to defeat a project they oppose, project opponents have every incentive to publicize the risks of adverse consequences. If they can use NEPA to force the agency itself to identify such risks, all the better. Moreover, project opponents have every reason to focus on the severity of the risk rather than its likelihood. Project opponents can thus become “worst-case entrepreneurs, attempting to ensure that people consider the worst that might happen,”¹⁴¹ either because they believe the worst actually might happen or because, in heated public debate, the distinction between a slim possibility and a likely result may be lost.

Integrating the agency and opponent perspectives, it is apparent why environmental risks present such a quandary for attempts to improve the quality of information and discourse about environmental risks and uncertainties. On the one hand, there seems to be ample basis for questioning agencies’ willingness and ability to fully investigate and disclose possible adverse consequences of their proposed actions that they regard, and have strong incentive to regard, as unlikely and perhaps exceedingly unlikely. On the other hand, members of the public may seize on environmental risks, even those that are highly unlikely, to build opposition to a proposed action, and in doing so may focus on the severity of a risk’s consequence rather than its low probability of occurrence. Discussing uncertainties is thus important to informed decision making but also “provides ammunition to project opponents.”¹⁴² There is “a difficult balance between alerting and informing people about serious risks and creating exaggerated and harmful fears.”¹⁴³

In light of these dynamics, neither a rule requiring worst-case analysis nor the existing ad hoc mix of doctrine provides a beneficial solution. Project opponents are likely to misrepresent or misunderstand the results of worst-case analyses, and in any event agencies facing every incentive to approach risks and uncertainties with optimism are likely to exhibit

139. Slovic, *supra* note 92, at 982 (citing George F. Loewenstein et al., *Risk as Feelings*, 127 PSYCHOL. BULL. 267, 276 (2001)); *see also id.* (noting that “societal concerns about hazards . . . fail to recede in response to information about the very small probabilities of the feared consequences from such hazards”).

140. SUNSTEIN, *supra* note 100, at 26, 60–63.

141. *Id.* at 26–27. Sunstein refers to government officials who focus attention on the risks of terrorism, but the description applies equally well in this context.

142. Farber, *supra* note 70, at 32. Farber, citing the benefits of “a candid discussion of the limits of the agency’s ability to predict the future,” does not think this is necessarily an adverse result. *Id.*

143. Slovic, *supra* note 92, at 984.

extreme resistance to worst-case analysis. Worst-case analysis, by attempting to force agencies to focus on extreme scenarios without regard to whether they actually pose a significant risk, is therefore likely to exacerbate the biases and intransigence of both agencies and project opponents. Existing doctrine, on the other hand, is both too stringent and too lax: too lax when it simply defers to agency judgment, and too stringent when it reflexively invokes the “hard look” mandate to require discussion of a risk or uncertainty.

CONCLUSION: A BETTER ALTERNATIVE

The three complicating factors discussed in Part III undermine the rationales for attempting to address risks and uncertainties in environmental planning with a worst-case analysis requirement. First, worst-case scenarios are too conceptually ambiguous and slippery to form the basis for legal requirements that would bind agencies. Conceptual ambiguity would beget legal indeterminacy; worst-case analysis’s supposed bright-line rule would become anything but. Second, risks and uncertainties are too pervasive in environmental planning to require across-the-board discussion of them in NEPA analyses, as worst-case analysis would appear to require. Moreover, such a requirement, insofar as it invites questioning agencies over every methodological judgment they make (because every such judgment is a potential source of uncertainty), is in tension with fundamental principles of deference to agency decision making. Third, both agencies and members of the public face strong incentives to downplay (in the case of agencies) or to magnify (in the case of opponents) possible consequences of agency action that are unlikely but would be severe if they were to eventuate. These incentives make it unlikely that agencies and the public will engage constructively on low-probability risks like worst-case scenarios.

In sum, environmental risks and uncertainties are ill suited to a bright-line rule such as worst-case analysis and instead require a more context-sensitive approach that better reflects the complex interplay of ecological processes, patterns of human behavior, and administrative politics that drives NEPA implementation. A functional approach to addressing risks and uncertainties in NEPA analysis would take into account and respond to the challenges identified in this Article. A functional approach would not necessarily differ dramatically from current NEPA case law. Both current NEPA law and a functional approach emphasize case-specific context over bright-line rules, and both effect a balance that reflects the significance of risks and uncertainties to environmental planning but also attempts to avoid overwhelming agencies and the public with additional information. That being said, the functional approach this Article proposes

would improve NEPA's treatment of risks and uncertainties in some significant respects by adding analytical focus to improve the clarity and functionality of NEPA's treatment of risks and uncertainties. In short, it would have advantages over both a bright-line worst-case analysis requirement and the doctrinal hodgepodge of current NEPA law.

First, requirements for addressing risks and uncertainties under NEPA must focus on identifying characteristics of risks that make them significant and therefore worth considering, instead of pretending that the "worst case" or "reasonably foreseeable" standards provide useful guidance. The significance of a risk depends on a contextual balancing of at least three variables: (a) the probability of the risk; (b) the severity of the risk; and (c) the uncertainty associated with the probability and/or severity.¹⁴⁴ Consideration of these variables should guide an agency's determinations as to which risks and uncertainties it should address in its NEPA analysis. The variables need not be quantifiable to be considered. Indeed, assessing individual variables, in particular the severity of a risk, may require evaluation of numerous complex factors.¹⁴⁵ A threshold test for significant risk that focuses explicitly on the characteristics of probability, severity, and uncertainty represents an important improvement over both "worst case," which focuses solely on the severity of the risk, and the current focus on "reasonable foreseeability," which as explained above is widely recognized as indeterminate.¹⁴⁶

Arrays of statistical and analytical techniques exist to characterize risks and uncertainties. Monte Carlo simulations, for example, use a range of values for each uncertain variable to calculate a range of possible outcomes and the relative probabilities that they will occur.¹⁴⁷ The Monte Carlo method is a powerful tool for quantitatively characterizing uncertainty, but it requires quantitative data and assumptions about the probability distributions associated with uncertain variables. As another example, where the

144. Although some scholars have posited that credibility is an important determinant of whether a risk bears examination, this Article criticizes its usefulness to that inquiry. *See supra* notes 81–82 and accompanying text. To the extent credibility has any utility in the inquiry, it is either subsumed in the factors identified or it does not have distinctive importance to the significance of a risk—in other words, every determination, regardless of whether it involves risk or uncertainty, should favor information that is credible.

145. *See supra* text accompanying note 99.

146. *See supra* notes 87–89 and accompanying text. That being said, the three-variable standard for significance does not require abandoning reasonable foreseeability. To facilitate adoption of the three-factor standard for significance without appearing to reject existing regulations or case law, courts could characterize the three-factor standard as an approach to assessing reasonable foreseeability, clarifying this problematic concept.

147. *See, e.g.,* Darrell Duffie & Peter Glynn, *Efficient Monte Carlo Simulation of Security Prices*, 5 ANNALS APPLIED PROBABILITY 897 (1995); Michael P. Hanratty & Francis S. Stay, *Field Evaluation of the Littoral Ecosystem Risk Assessment Model's Predictions of the Effects of Chlorpyrifos*, 31 J. APPLIED ECOLOGY 439 (1994).

range of possible outcomes can be determined but the relative probabilities of outcomes along the range cannot be ascertained, α -maximin models call for simply weighting the best possible and worst possible outcomes, thereby allowing decision makers to balance “our hopes (for the best case) and our fears (of the worst case).”¹⁴⁸ Some analytical techniques require quantified data, some do not. Some are resource intensive and time consuming, some are not. As with risks and uncertainties generally, there is no single method appropriate for all NEPA analyses that encounter risks and uncertainties. Determining what statistical and analytical methods are well suited to an agency’s situation thus will always depend on context. But context sensitivity should not give agencies complete discretion in choosing their approaches to characterizing uncertainty. It is reasonable to require agencies to assess and explain their approaches to risks and uncertainties, especially where an agency has declined to avail itself of a potentially useful method specifically proposed by a commenter. Agencies and CEQ can promote thoughtful discussions by developing a menu of potentially useful methods, including a summary of the requirements and relative advantages of each method.

Second, to give analytical focus and avoid NEPA’s tendency to generate information rather than thoughtful consideration, agencies’ discussions of risks and uncertainties should focus on their relationship to the ultimate decision facing the agency. As this Article has argued throughout, risks and uncertainties do not lend themselves to a uniform approach. There are many different sources and types of risk or uncertainty in agency decision making: some that arise from natural variation, some that arise from unpredictable human behavior, some that arise from limited information due to resource constraints, and some that arise from imperfect understanding of complex systems and processes. There are, moreover, multiple ways in which risks and uncertainties may bear on an agency’s decision making: they may be relevant to whether to take an action, to deciding what precautions to take if the agency takes the action, to selecting adaptive management strategies for mitigating risks that do eventuate, and to preparing and planning for catastrophic emergencies. Each of these purposes may be more or less important depending on the specific circumstances of the situation before the agency.¹⁴⁹ This variability necessitates flexibility.

148. Farber, *supra* note 3, at 930.

149. Moreover, sometimes independent requirements from other statutes may address some of these potential purposes. For example, the Clean Water Act and Clean Air Act require emergency planning for worst-case oil spills and chemical accidents, respectively. 33 U.S.C. § 1321(j)(5)(A)(i) (2006) (requiring owners and operators of tank vessels and facilities to prepare response plans that include “a plan for responding, to the maximum extent practicable, to a worst case discharge”); 42 U.S.C. § 7412(r)(7)(B)(ii)(I) (2006) (requiring hazard assessment for chemical accidents that “shall include an evaluation of worst case

Differences in the mix of sources and types of risk and different types of relevance to the agency's decision warrant different treatment in the agency's NEPA document. Planning for an emergency response to an oil spill is different from monitoring airline passengers to prevent importation of invasive alien species, even if both are significant risks worthy of attention in an agency's environmental planning. Mere disclosure of significant risks and uncertainties is not necessarily adequate; agencies should focus on how their consideration of risks and uncertainties can improve their decision making.

Focusing more closely and explicitly on the relationship between the risk or uncertainty and the decision before the agency both limits and deepens the requirements on the agency. On the one hand, NEPA should not require much if anything with respect to a risk or uncertainty that has limited significance to the agency's ultimate decision—for example, uncertainty about which of two methodologies is more accurate, where both yield similar results. On the other hand, when a risk or uncertainty is important to an agency's decision—such as when a significant outcome is very sensitive to an uncertain variable—it should be discussed in the agency's evaluation of the impacts and alternatives, not buried in the agency's methodological description.

Just as NEPA is premised overall on the hope that requiring agencies to consider environmental consequences will lead them to reduce adverse environmental impacts, one can hope that requiring agencies to consider environmental risks and uncertainties will affect their treatment of risks and uncertainties. Focusing more explicitly on the relationship of risks and uncertainties to the decision before the agency would help to increase the relevance of the discussion of risks and uncertainties. For example, prominently disclosing uncertainty in its decision analysis may induce an agency to engage in monitoring so that it can take corrective action if a risk eventuates. An appropriate model for a disclosure requirement that provides useful analytical focus may be the Securities and Exchange Commission (SEC) guidance that provides a dual approach to addressing uncertainties

accidental releases"). To take another example, Clean Water Act regulations require some operators of cooling water intake structures to monitor certain environmental parameters and to take corrective action when those parameters are not meeting expectations. 40 C.F.R. § 125.95(b)(4)(ii) (2010). These requirements operate independent of NEPA, but depending on the circumstance they may provide a mechanism for addressing aspects of environmental risks that agencies and ultimately courts should appropriately take into account in deciding what NEPA requires with respect to such risks. A requirement that an agency or permittee monitor and take corrective action, for example, may sufficiently protect against an environmental risk that the agency may appropriately conclude in its NEPA analysis is insignificant.

in corporate 10-K filings.¹⁵⁰ In addition to requirements for specific risks and uncertainties underlying a business's financial statements, the SEC also requires businesses to highlight and discuss the implications for their overall financial condition of key uncertainties that rise to the level of critical accounting estimates and assumptions.¹⁵¹ Current NEPA law, insofar as it has been read merely to require disclosure of risks and uncertainties, too easily allows the discussion to be buried among other voluminous methodological trivia, off the radar screen of the agency decision makers and the public.

Third, procedural standards that apply to agencies and to the interested public should be vigorously enforced to counteract biases and reduce opportunistic behavior by both agencies and opponents which can undermine the integrity of the NEPA process. When cases are litigated, for example, both agencies and opponents should be strictly confined to the administrative record.¹⁵² The onus on an agency to address a specific risk or uncertainty should depend to a great extent on the specificity with which the risk or uncertainty was raised during the administrative process.¹⁵³ Where a risk or uncertainty was raised only generally or in passing in comments before the agency, agencies should be given broad leeway in choosing how much to address the topic; when a more specific or detailed objection is raised, the agencies' burden should increase as well. In general, substantive requirements should be applied flexibly to reward agencies that make good-faith, reasonable attempts at environmental planning and to acknowledge the variety of legitimate approaches to addressing risks and uncertainties and

150. Commission Guidance Regarding Management's Discussion and Analysis of Financial Condition and Results of Operations, 68 Fed. Reg. 75,056 (Dec. 29, 2003).

151. *Id.* at 75,057, 75,064–65; see generally Oren A. Amram, *When Worlds Collide: Transfer Pricing Tax Strategies and the Securities Laws*, 8 U.C. DAVIS BUS. L.J. 324, 344–45 (2008) (discussing the SEC guidance); William O. Fisher, *Where Were the Counselors? Reflections on Advice Not Given and the Role of Attorneys in the Accounting Crisis*, 39 GONZ. L. REV. 29, 99 n.170 (2004) (discussing the SEC guidance).

152. Although a guiding principle of judicial review under the APA is that the court's review should be limited to the administrative record developed before the agency, see *Camp v. Pitts*, 411 U.S. 138, 142 (1973), a surprising number of cases allow extra-record affidavits and testimony in NEPA cases, without explaining why the evidence could not have been produced before the agency, see, e.g., *Ohio Valley Envtl. Coal. v. Aracoma Coal Co.*, 556 F.3d 177, 201 (4th Cir. 2009) (allowing consideration of expert witness testimony on the grounds that "a NEPA suit is inherently a challenge to the adequacy of the administrative record"); *Colo. Wild v. Vilsack*, 713 F. Supp. 2d 1235, 1239–42 (D. Colo. 2010) (holding that a "NEPA exception" exists to the general prohibition against supplementing the administrative record with additional testimony not presented to the agency).

153. *Cf. Lands Council v. McNair*, 537 F.3d 981, 1001 (9th Cir. 2008) (holding that the Forest Service need not "affirmatively present every uncertainty in its EIS," but rather "must acknowledge and respond to comments by outside parties that raise significant scientific uncertainties and reasonably support that such uncertainties exist").

the numerous judgments that are required for NEPA analyses. Agencies should not, however, be allowed to avoid meaningful engagement with the risks and uncertainties that underlie their analyses by burying discussions of significant risks and uncertainties deep in their NEPA documents.

Despite the superficial allure of an apparently bright-line rule like a worst-case analysis requirement, the functional approach outlined here offers important advantages. A context-sensitive standard reflects the complex mix of factors that determine whether a risk or uncertainty is significant enough to warrant discussion and consideration in a NEPA document. Variability in the types of risks and uncertainties, data availability, resource and time constraints, and the ways in which risks and uncertainties can be relevant to agencies' decisions also require flexibility in requirements for how risks and uncertainties should be discussed.

There are, of course, downsides to flexibility, which should not be dismissed lightly. Flexibility and context sensitivity can resemble ad hoc decision making, which has its disadvantages. Ad hoc standards can impair transparency and exacerbate biases.¹⁵⁴ They also can allow inconsistency and, potentially, analytical laziness.¹⁵⁵ The legal unpredictability that results from flexible standards also makes it difficult to plan, increases the likelihood of costly and time-consuming litigation, and invites courts to inject policy preferences into their decisions. But this is only in comparison to a bright-line rule that actually creates clarity. A rule that only looks clear and only appears to create bright-line distinctions, but loses its clarity when implemented, is even more pernicious than ad hoc decision making because it obscures rather than highlights the judgments the agency must make. The result will either be unfettered agency discretion or courts applying idiosyncratic review criteria. Moreover, context-sensitive standards do not necessarily devolve to ad hocery if they maintain analytical focus. A functional approach does not give agencies unfettered discretion in how they address risks and uncertainties, but rather evaluates agencies' approaches in terms of how well they effectuate NEPA's goals. So long as agencies and courts stay focused on that pragmatic inquiry, they will avoid the pitfalls of flexible standards.

The debate over how NEPA should address risks and uncertainties is occurring within the context of a broader ongoing evaluation of NEPA's successes and shortcomings.¹⁵⁶ Some of the proposals that have been

154. See Owen, *supra* note 105, at 313–26.

155. Cf. Helen Norton, *Constraining Public Employee Speech: Government's Control of its Workers' Speech to Protect its Own Expression*, 59 DUKE L.J. 1, 63–64 (2009) (noting that flexibility in legal rules can lead to inconsistent results); Ric Simmons, *Private Plea Bargains*, 89 N.C. L. REV. 1125, 1179 (2011) (noting that the flexibility afforded by plea bargaining in criminal cases can lead to inconsistent results).

156. See *supra* Part I.

forwarded for reforming NEPA generally could improve how agencies address environmental risks and uncertainties. Brad Karkkainen, for example, has argued persuasively that NEPA should shift away from ex ante prediction toward more monitoring and adaptive management to mitigate adverse impacts as they arise.¹⁵⁷ His approach, if adopted, could reduce the eventuation of environmental risks, both by providing information feedback that improves ex ante predictions regarding environmental risks and by emphasizing post-decision actions that can mitigate risks more effectively as more information becomes available over time.¹⁵⁸ But even promising proposals for general NEPA reform such as Karkkainen's cannot solve or avoid the conundrums that plague planning for environmental risks and uncertainties. Environmental planning necessarily requires ex ante predictions based on information that will always be imperfect and incomplete.¹⁵⁹ Any benefits that general NEPA reforms can provide in this area will be on the margin, which is not to say that they will not be important or significantly beneficial. It is to say, however, that regardless of what happens with NEPA overall, there is and will be a strong need for an approach for dealing with the specific problem of risks and uncertainties.

Adopting a functional approach to risks and uncertainties under NEPA would not require amending NEPA, its implementing regulations, or any fundamental principles that have arisen in NEPA cases. In that sense, adopting a functional approach would refine rather than rewrite existing NEPA law. This creates a relatively easy opportunity for CEQ, the institution charged with coordinating NEPA implementation across all federal agencies, to promote adoption of a functional approach to risks and uncertainties. In recent years, CEQ has issued several new guidance documents for the purpose of promoting effective NEPA implementation.¹⁶⁰ Courts

157. Karkkainen, *supra* note 24; see also Dinah Bear, *Some Modest Suggestions for Improving Implementation of the National Environmental Policy Act*, 43 NAT. RESOURCES J. 931, 941–48 (2003) (arguing in favor of more post-decision monitoring under NEPA).

158. See Karkkainen, *supra* note 24, at 907–08.

159. Other proposed changes to NEPA law are not aimed specifically at environmental risks and uncertainties and therefore would have even less effect on planning for environmental risks. See, e.g., Bear, *supra* note 157, at 949–54 (urging clarification of the extent of NEPA's extraterritorial application). To the extent they improve the effectiveness of NEPA generally, they may improve planning for environmental risks. However, some proposed changes may complicate the task of planning for environmental risks, even if they improve NEPA's effectiveness overall. See, e.g., *id.* at 954–57 (proposing that NEPA documents should include more analysis of social impacts); James L. Connaughton, *Modernizing the National Environmental Policy Act: Back to the Future*, 12 N.Y.U. ENVTL. L.J. 1, 9 (2003) (arguing in favor of agencies engaging in more programmatic analysis); Mandelker, *supra* note 11, at 307–11, 312 (calling for agencies to expand their NEPA analyses by including more indirect environmental impacts).

160. See, e.g., Memorandum from Nancy H. Sutley, Chair, Council on Env'tl. Quality, to Heads of Fed. Dep'ts and Agencies regarding Appropriate Use of Mitigation and Monitoring

have relied on this guidance in interpreting NEPA's mandates.¹⁶¹ CEQ could improve the effectiveness of NEPA analyses across the federal government and exert a positive influence on the development of NEPA law in the courts by issuing a new guidance document that advises federal agencies to adopt a functional approach to risks and uncertainties in their NEPA documents. The result could be NEPA documents that, without increasing the burdens on federal agencies, usefully address risks and uncertainties in a way that advances NEPA's goal of environmentally informed decision making across the federal government.

and Clarifying the Appropriate Use of Mitigated Findings of No Significant Impact (Jan. 14, 2011); Memorandum from Nancy H. Sutley, Chair, Council on Env'tl. Quality, to Heads of Fed. Dep'ts and Agencies regarding Establishing, Applying, and Revising Categorical Exclusions Under the National Environmental Policy Act (Nov. 23, 2010); Memorandum from James L. Connaughton, Chairman, Council on Env'tl. Quality, to Heads of Fed. Agencies regarding Guidance on the Consideration of Past Actions in Cumulative Effects Analysis (June 24, 2005).

161. *See, e.g.*, *League of Wilderness Defenders Blue Mountains Biodiversity Project v. Allen*, 615 F.3d 1122, 1135–36 (9th Cir. 2010); *Ky. Riverkeeper, Inc. v. Midkiff*, No. 05-cv-00181-DLB, 2011 WL 2789086, at *18 (E.D. Ky. July 14, 2011).