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## IRREPARABILITY AS IRREVERSIBILITY

Cass R. Sunstein\*

### Abstract

*Some things, people say, are “gone forever.” But what exactly does that mean? Some losses are irreparable in the sense that nothing can be done to restore the status quo ante – or if something can be done, it is not enough (or perhaps outsiders can never know if it is). The Irreversible Harm Precautionary Principle takes the form of an insistence on paying a premium to freeze the status quo and to maintain flexibility for the future, while new information is acquired. In many settings, it makes sense to pay for an option to avoid a risk of irreversible losses. An implicit understanding of option value can be found in the emphasis on irreversibility in National Environmental Policy Act and other federal statutes, along with many international agreements. The idea of irreversibility offers a distinctive perspective on the legal concept of “irreparable harm,” a prerequisite for granting preliminary injunctions. In fact some irreparable harms seem to qualify as such precisely because they are irreversible. We can obtain new insights into the time-honored idea of irreparable harm through the lens of irreversibility, especially in environmental cases but also in many contexts, including freedom of speech, privacy, and discrimination on the basis of race and sex.*

### I. GONE FOREVER

Some things, people say, are “gone forever.” But what exactly does that mean? At a minimum, it suggests that certain losses are final in the sense that they are *irreversible*. Such losses are irreparable in the sense that nothing can be done to restore the status quo ante – or if something can be done, it is not enough (or perhaps outsiders can never know if it is). The experience of grief is usually produced by a sense not only that the loss is large, but also that it cannot be reversed.

Consider some examples. If children are killed, they cannot be brought back to life. If a soldier loses the use of his leg, he cannot grow it back. If a species is lost, it is probably lost forever; the same might well be true of pristine areas. Some people fear that genetically modified organisms might lead to irreversible ecological harm; transgenic crops can impose irreversible losses by increasing pest resistance. In recent decades, the problem of

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\* Robert Walmsley University Professor, Harvard University. This essay builds on and elaborates a preliminary treatment in Cass R. Sunstein, *Laws of Fear* (Cambridge 2005), and on some ideas developed elsewhere, with a new focus on irreparable harm and preliminary injunctions and several novel directions. I am grateful to Madeleine Joseph for valuable comments and research assistance.

climate change has raised serious concerns about irreversibility. Some greenhouse gases stay in the atmosphere for centuries, and for that reason climate change threatens to be irreversible, at least for all practical purposes. And, of course, genocide may be the most extreme case of irreversible harm.

The idea of irreversibility overlaps with the legal concept of “irreparable harm,” a prerequisite for granting preliminary injunctions.<sup>1</sup> In fact some irreparable harms seem to qualify as such precisely because they are irreversible. A standard claim is that some goods have no substitute; consider the loss of companionship with a loved one. A restriction on free speech is usually seen as producing irreparable harm, and violations of constitutional rights are often regarded similarly.<sup>2</sup> It is also standard to emphasize that judges cannot reliably measure or quantify certain harms, such as the loss stemming from unauthorized use of intellectual property; a copyright violation might be found to involve an “irreparable” loss simply because valuation is so uncertain.<sup>3</sup> Judges may be in a poor position to turn certain harms into monetary equivalents (either before or after the fact of loss). On this account, an injury is “irreparable” not because it involves a unique loss, but because of some epistemic deficit faced by the legal system.

But the standard claims raise many puzzles. A loss of companionship with a loved one is, in an intelligible sense, “irreparable,” but courts do award compensation for loss of companionship. In that light, the claim cannot be that companionship has infinite value or cannot be turned into some monetary equivalent. A restriction on free speech may be exceedingly difficult to value, but in what sense is it “irreparable”? A loss of the ability to protest for (say) a few weeks might not be worth more than (say) \$2 billion. Regulators have established tools for dealing with the problem of uncertainty, and perhaps judges could use such tools as well.<sup>4</sup>

With puzzles of this kind in mind, federal courts, including the Supreme Court, have long debated the meaning of the irreparable harm requirement,<sup>5</sup> often in the context of violations of the National Environmental Policy Act (NEPA).<sup>6</sup> As the Court once put it, “[e]nvironmental injury, by its nature, can seldom be adequately remedied by money damages.”<sup>7</sup> As it turns out, the question whether and when NEPA violations trigger preliminary injunctions raises deep questions at the intersection of law, economics,

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<sup>1</sup> See Douglas Laycock, *The Death of the Irreparable Injury Rule* (Oxford 1991); Owen Fiss, *The Civil Rights Injunction* (Indiana 1978); Douglas Lichtman, *Uncertainty and the Standard for Preliminary Relief*, 70 U Chi L Rev 1977 (2003).

<sup>2</sup> See *Elrod v Burns*, 427 US 347, 373 (1976) (“[L]oss of First Amendment freedoms, for even minimal periods of time, unquestionably constitutes irreparable injury.”).

<sup>3</sup> 35 See, e.g., *Apple Computer, Inc. v. Formula Int’l, Inc.*, 725 F.2d 521, 525-26 (9<sup>th</sup> Cir 1984) (stating that irreparable injury is presumed when copyright is infringed); *Atari, Inc. v. North Am. Philips Consumer Elecs. Corp.*, 672 F.2d 607, 620 (7<sup>th</sup> Cir 1982) (same); *Wainwright Sec., Inc. v. Wall St. Transcript Corp.*, 558 F.2d 91, 94 (2d Cir 1977) (same).

<sup>4</sup> See Cass R. Sunstein, *The Limits of Quantification*, 102 Cal L Rev 1369 (2014).

<sup>5</sup> See, for example, *Winter v Natural Resources Defense Council*, 555 US 7 (2008).

<sup>6</sup> *Monsanto Co v Geertson Seed Farms*, 561 US 139 (2010). For general discussion, see Leslye A. Herrmann, Comment, *Injunctions for NEPA Violations: Balancing the Equities*, 59 U Chi L Rev 1263 (1992).

<sup>7</sup> *Amoco Production Co v Village of Gambell*, 480 US 531, 545 (1987).

ethics, and political philosophy. The potential answers bear on the meaning of irreparable harm more generally.

My goal here is to explore the idea of irreversibility, with particular reference to preliminary injunctions, environmental problems, and some enduring controversies within the Supreme Court. In one sense, any losses are irreversible, simply because time is linear. If Jones plays tennis this afternoon rather than working, the relevant time is lost forever. If Smith fails to say the right words to a loved one, at exactly the right time, the opportunity might be gone forever. If one nation fails to take action to deter the aggressive steps of another, in a particular year, the course of world events might be irretrievably altered. If a project to drill oil in Alaska is delayed for five years, there is an irreversible loss as well: The oil that might have been made available will not be made available when it otherwise would have been. An injunction can prevent irreversible harm; it can also create irreversible harm.

When environmentalists emphasize the importance of irreversibility, I suggest that they have two separate ideas in mind. The first is connected with the idea of option value, and in particular with the view that when information is missing, it is worthwhile to spend resources to maintain future flexibility as knowledge increases. A central goal is to freeze the status quo while new information is obtained – a point that bears on many disputes involving NEPA, where acquisition of such information is the basic point. The second involves losses of goods that are incommensurable in the sense that they are qualitatively distinctive. It might be possible to translate the value of a pristine area into some monetary equivalent, but (the argument goes) something important is lost in translation. As we shall see, legal (as opposed to philosophical) use of ideas about incommensurability is best combined with claims about uncertainty about valuation – the epistemic problem faced by judges.

Here, as elsewhere, general propositions do not decide concrete cases, and neither of these ideas, standing by itself, is sufficient to justify a preliminary injunction in environmental cases. But as we shall see, it is much easier to understand the concept of irreparable harm by reference to them.<sup>8</sup> As we shall also see, the exploration of the underlying puzzles bears on a wide range of questions about appropriate precautions, not only in the environmental arena, but in other legal domains, such as constitutional law, and in daily life as well.

## **II. The Irreversible Harm Precautionary Principle**

Concerned about the problem of irreversibility, sensible legal systems might want to adopt a distinctive principle for handling certain kinds of risk: the Irreversible Harm Precautionary Principle. Indeed, some such principle seems to underlie prominent

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<sup>8</sup> I am acutely aware that the topic of irreparable harm can be approached from many different angles, and what I am offering here is just one view of the cathedral. Valuable discussions from diverse perspectives can be found in many places, including Laycock (cited in note 1); Fiss (cited in note 1); John Leubsdorf, *The Standard for Preliminary Injunctions*, 91 Harv L Rev 525 (1978); Thomas R. Lee, *Preliminary Injunctions and the Status Quo*, 58 Wash & Lee L Rev 109 (2001).

accounts of the Precautionary Principle, which point explicitly to the problem of irreversibility. For example, the United Nations Framework Convention on Climate Change proclaims: “Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing [regulatory] measures, taking into account that policies and measures to deal with climate change should be cost-effective so as to ensure global benefits at the lowest possible cost.”<sup>9</sup> Similarly, the Rio Declaration states, “Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.”<sup>10</sup> The idea of irreversibility has become a prominent part of international discussion of the Precautionary Principle and indeed of environmental ethics in general.

### A. Freezing the Status Quo

The general attitude here is “stop, and then learn,” as opposed to the tempting alternative of “keep doing what you have been doing, and then learn.” The goal is to freeze the status quo. It is true that for climate change, some people (though increasingly few) continue to believe that research should be our first line of defense. In their view, nations should refuse to commit substantial resources to reducing greenhouse gas emissions until evidence of serious harm is even clearer than it now is. Many people believe that our initial steps should be relatively cautious, increasing in aggressiveness as knowledge accumulates (and the costs of emissions reductions fall). In this domain, however, there is a large problem with any approach of “keep doing what you have been doing, and then learn.” We might want to maintain the status quo while we learn. If precautionary steps are not taken immediately, the results may be irreversible, or at best difficult and expensive to reverse. The claim that greenhouse gas emissions should be cut dramatically, and now, can be seen as a large-scale reflection of the same principles that underlie the issuance of preliminary injunctions.

In American environmental law, related ideas are at work. San Francisco has adopted its own precautionary principle, with an emphasis on irreversibility: “Where threats of serious or irreversible damage to people or nature exist, lack of full scientific certainty about cause and effect shall not be viewed as sufficient reason for the City to postpone cost effective measures to prevent the degradation of the environment or protect the health of its citizens.”<sup>11</sup> At the federal level, NEPA requires agencies to discuss “any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.”<sup>12</sup> Though the law is in flux, some courts have been careful to insist that environmental impact statements should be prepared at a time that permits consideration of environmental effects before irretrievable commitments have been made.<sup>13</sup> A number of other federal statutes, especially in the

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<sup>9</sup> See Indur Goklany, *The Precautionary Principle: A Critical Appraisal of Environmental Risk Assessment* 6 (Cato Institute 2001).

<sup>10</sup> Quoted in Bjorn Lomborg, *The Skeptical Environmentalist* 347 (Cambridge 2001).

<sup>11</sup> See Precautionary Principle Ordinance, SF Enviro Code § 101 (2018).

<sup>12</sup> 42 USC §102 (c)(5) (2012).

<sup>13</sup> See *Metcalf v Daley*, 214 F3d 1135 (9th Cir 2000); *Scientists Institute For Public Information v Atomic Energy Commission*, 481 F2d 1079 (DC Cir 1973); *Sierra Club v Marsh*, 976 F2d 763 (1st Cir 1985).

environmental context, specifically refer to irreversible losses and make their prevention a high priority.<sup>14</sup> Within the federal courts, including the Supreme Court, a special precautionary principle has sometimes seemed to underlie the analysis of preliminary injunctions in cases involving a risk of irreparable environmental harm.<sup>15</sup>

Nonetheless, the Court has squarely rejected a presumption in favor of preliminary injunctions in environmental cases, including those that involve NEPA.<sup>16</sup> That conclusion might be taken to settle longstanding uncertainty about how to think of irreparable harm in the context of NEPA cases.<sup>17</sup> Consider in this regard the fact that NEPA is a purely procedural statute, one that imposes information-gathering duties on agencies *without requiring them to take that information into account*.<sup>18</sup> If courts cannot forbid agencies to act as they choose after producing an adequate environmental impact statement, injunctions might seem an odd remedy in the NEPA setting. But in the most elaborate discussion of the question, one that the Supreme Court has not squarely confronted, then-Circuit Judge Breyer suggested that injunctions are often appropriate in NEPA cases.<sup>19</sup>

## B. The Psychology of Decisionmakers

Judge Breyer did not contend that a presumption in favor of injunctive relief would be appropriate for environmental cases in general. Instead he argued that NEPA is meant to prevent a particular kind of injury, one that should play a central role in the decision whether to grant an injunction. The purpose of NEPA is to ensure that officials take environmental considerations into account *before* they embark on a course of action. “Thus, when a decision to which NEPA obligations attach is made without the informed environmental consideration that NEPA requires, the harm that NEPA intends to prevent has been suffered.”<sup>20</sup>

That harm is the increased risk to the environment that arises “when governmental decisionmakers make up their minds without having before them an analysis (with prior public comment) of the likely effects of their decision upon the environment.”<sup>21</sup> This is a distinctive NEPA risk, foreign to the common law or indeed to the legal system before

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<sup>14</sup> See, for example, 33 USC § 2712(j) (making special exception to planning requirement for use of federal resources in a situation requiring action to avoid irreversible loss of natural resources”); 42 USC § 9611(i) (same exception for Superfund cleanups); 22 USC § 2151p-1 (c)(2)(A) (requiring President to assist developing countries in a way that responds to “the irreversible losses associated with forest destruction”).

<sup>15</sup> See *Amoco Production Co v Village of Gambell*, 480 US 531 (1987); *Sierra Club v US Dept of Agriculture*, 841 F Supp 349, 358-59 (DDC 2012).

<sup>16</sup> *Winter*, 555 U.S. at 21.

<sup>17</sup> See *New York v Nuclear Regulatory Commission*, 550 F2d 745 (2d Cir 1977); *Conservation Society v Secretary of Transportation*, 508 F2d 927, 933-3 (2d Cir 1974); *United States v 27.09 Acres of Land*, 737 F Supp 277, 283-84 (SDNY 1990); *Stand Together Against Neighborhood Decay v Board of Estimate*, 690 F Supp 1191 (EDNY 1988); Richard R.W. Brooks & Warren F. Schwartz, *Legal Uncertainty, Economic Efficiency, and the Preliminary Injunction Doctrine*, 58 Stan L Rev 381 (2005).

<sup>18</sup> See *Robertson v Methow Valley Citizens Council*, 490 US 332 (1989).

<sup>19</sup> *Sierra Club v Marsh*, 872 F2d 497(1st Cir 1989).

<sup>20</sup> *Id* at 500.

<sup>21</sup> *Id*

the enactment of that statute. The risk involves a failure of ex ante consideration of environmental effects – and a failure to freeze the status quo *before* those effects are considered.

Irreversibility is central here, for it is simply true that administrators are less likely to destroy a nearly completed project than one that has only started. The relevant harm “may well have to do with the psychology of decisionmakers, and perhaps a more deeply rooted psychological instinct not to tear down projects once they are built.”<sup>22</sup> Judge Breyer’s point, then, is that “the district court should take account of the potentially irreparable nature of this decisionmaking risk to the environment when considering a request for preliminary injunction.”<sup>23</sup> This is a point about irreversibility – about how the clock cannot be unwound to restore the status quo ante. As it turns out, that point is connected with a standard view about irreversibility in economics.

### III. Uses, Options, and Irreversibility

#### A. Existence Value, Option Value

To fix ideas, consider the monetary valuation of an environmental good, such as a pristine area. Some people will be willing to pay to use the area; they may visit it on a regular basis, and they might be very upset at its loss. But others will be willing to pay to preserve it, even if they will not use it. In fact many citizens would be happy to give some money to save a pristine area, perhaps especially if animals can be found there. Hence “existence value” is sometimes included in the valuation of environmental goods,<sup>24</sup> and indeed federal courts have insisted that agencies pay attention to that value in assessing damages to natural resources.<sup>25</sup> Taken as a group, citizens of many nations would be willing to pay a great deal to preserve an endangered species or to maintain the existence of a remote island and its ecosystem.

But some people are also willing to pay for the *option* to use or to benefit from an environmental amenity in the future, even if they are unsure whether they will exercise that option at any time. Suppose that a pristine area might be developed in a way that ensures its permanent loss. Many people would be willing to pay a significant amount to preserve their option to visit that area. Under federal law, option value must also be considered in the assessment of natural resource damages.<sup>26</sup> Some regulations pay attention to option value in the environmental context.<sup>27</sup> For numerous goods, people are willing to pay and to do a great deal in order to freeze the status quo and ensure that their options are preserved.

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<sup>22</sup> Id at 504.

<sup>23</sup> Id at 501.

<sup>24</sup> See David A. Dana, *Existence Value and Federal Preservation Regulation*, 28 Harv Envir L Rev 343, 345 (2004); Charles J. Cicchetti and Louis J. Wilde, *Uniqueness, Irreversibility, and the Theory of Nonuse Values*, 74 Amer J Agric Econ 1121, 1121–22 (1992).

<sup>25</sup> See *Ohio v US Dept of the Interior*, 880 F2d 432, 464 (DC Cir 1989).

<sup>26</sup> Id

<sup>27</sup> See, for example, 60 Fed Reg 29914 (1995); 60 Fed Reg 28210, 29,914, 29,928 (1995); 59 Fed Reg 1062, 1078 (1994). But see 69 Fed Reg 68,444 (2004) (doubting whether option value should be recognized as separate from others values).

Here, then, is a simple sense in which irreversible harm causes a loss that should be considered and that must be included in measures of value. Some skeptics contend that it “is hard to imagine a price for an irreversible loss,”<sup>28</sup> but people certainly do identify prices for such losses, or at least for the risk of such losses. Whether or not we turn that value into some sort of monetary equivalent, it ought to matter.

The idea of option value, as used in the monetary valuation literature, is closely related to the use of the notion of “options” in the domain that I shall be emphasizing here. The simple claim is that when regulators are dealing with an irreversible loss, and when they are uncertain about the timing, magnitude, and likelihood of that loss, they should be willing to pay a sum—the option value—in order to maintain flexibility for the future. To do that, they freeze the status quo. The option might not be exercised if it turns out that the loss is not a serious one. But if the option is purchased, regulators will be in a position to forestall that loss if it turns out to be large.

The concern about irreversibility, and hence the Irreversible Harm Precautionary Principle, are based on the idea that regulators should be willing to buy an option to maintain their own flexibility. This point can easily be linked with Justice Breyer’s point about freezing the status quo and psychology in the context of environmental decisions: There is a large difference between making a decision *ab initio* and making a decision once building has started. (I am using terms that suggest monetary payments, but the basic point holds even if we are skeptical about the use of monetary equivalents; “purchases” can take the form of precautionary steps that do not directly involve money.)

Option theory has countless applications outside of the domain of investments. People would be willing to do, and possibly even to spend, a great deal to preserve their option to have another child – even if they are not at all sure that they really want to have another child. Or consider narrow judicial rulings, of the sort celebrated by judicial minimalists, who want courts to make decisions that are focused on particular details and that leave many questions undecided. Narrow rulings can be understood as a way of “buying” an option, or at least of “paying” a certain amount by imposing decisionmaking burdens on others, in return for future flexibility.

Judges who leave things undecided, and who focus their rulings on the facts of particular cases, are in a sense forcing themselves, and society as a whole, to purchase an option to pay for flexibility in the resolution of subsequent problems. Whether that option is worthwhile depends on its price and the benefits that it provides. Or consider the case of marriage and suppose that because of law or social norms, it is difficult to divorce, so that a decision to marry cannot readily be reversed. If so, prospective spouses might be willing to do a great deal to maintain their flexibility before marrying—far more than they would be willing to do if divorce were much easier.

It should be readily apparent how an understanding of option value can explain the emphasis, in NEPA and other environmental statutes, on irreversible losses. The central point of NEPA is to ensure that government officials give serious consideration to environmental factors before they take action that might threaten the environment. If the

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<sup>28</sup> See Frank Ackerman and Lisa Heinzerling, *Priceless: On Knowing the Price of Everything and the Value of Nothing* 185 (New Press 2004).



government is building a road through a pristine area, or drilling in Alaska, or licensing a nuclear power plant, it must produce an environmental impact statement discussing the environmental effects. The production of these statements can be burdensome and costly. But when potentially irreversible losses are involved, and when officials cannot specify the magnitude or likelihood of such losses, the public, and those involved in making the ultimate decision, ought to know about them.

What needs to be added is that if the (initial) decision is made before the environmental impact statement is issued, the status quo cannot be preserved. The irreversible loss, made relevant by NEPA, is that status quo, so that NEPA can have its desired effect. It is not necessarily a loss to the environment as such (though of course that loss matters); it is a loss of the relevant decisionmaking process. That loss might not be decisive, all things considered. But it counts.

## **B. Options, Imperfect Knowledge, and Precautions**

It should now be clear how the idea of option value might help support the Irreversible Harm Precautionary Principle. In environmental economics, the seminal analysis comes from Kenneth Arrow and Anthony Fisher, who demonstrate that the ideas of uncertainty and irreversibility have considerable importance to the theory of environmental protection.<sup>29</sup> Arrow and Fisher imagine that the question is whether to preserve a virgin redwood forest for wilderness recreation or instead to open it to clear-cut logging. Assume that if the development option is chosen, the destruction of the forest is effectively irreversible. Arrow and Fisher argue that it matters whether the authorities cannot yet assess the costs or benefits of a proposed development. If development produces “some irreversible transformation of the environment, hence a loss in perpetuity of the benefits from preservation,” then it is worth paying something to wait to acquire the missing information. Their suggestion is that “the expected benefits of an irreversible decision should be adjusted to reflect the loss of options it entails.”<sup>30</sup> Even if it is costly to wait, that cost might be worth incurring.

Fisher has generalized this argument to suggest that “[w]here a decision problem is characterized by (1) uncertainty about future costs and benefits of the alternatives, (2) prospects for resolving or reducing the uncertainty with the passage of time, and (3) irreversibility of one or more of the alternatives, an extra value, an option value, properly attaches to the reversible alternative(s).”<sup>31</sup> The intuition here is both straightforward and appealing: more steps should be taken to prevent harms that are effectively final than to prevent those that can be easily reversed, and if it is possible to acquire information over time, then it may make sense to wait. When an irreversible harm is on one side and a reversible one on the other, and when decisionmakers are uncertain about future costs and benefits of precautions, an understanding of option value suggests that it is worthwhile to

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<sup>29</sup> See Kenneth Arrow and Anthony Fischer, *Environmental Preservation, Uncertainty and Irreversibility*, 88 Q J Economics 312, 313–14 (1974).

<sup>30</sup> Id at 319.

<sup>31</sup> See Anthony C. Fisher, *Uncertainty, Irreversibility, and the Timing of Climate Policy* 9 (2001), available at <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.469.5209&rep=rep1&type=pdf>. A valuable discussion is Robert Pindyck, *Irreversibilities and the Timing of Environmental Policy*, 22 Energy and Resource Economics 233 (2000). Pindyck’s treatment of “sunk costs” and “sunk benefits” could easily be adapted to the preliminary injunction question in environmental cases; it repays careful study.

spend a certain amount to preserve future flexibility, by paying a premium to avoid the irreversible harm. A preliminary injunction can be seen as a payment of that premium.

The general point here is that, as in the stock market, those involved in environmental protection are trying to project a stream of good and bad effects over time; the ability to project the stream of effects will improve over time and hence much can be gained from being able to make the decision later in time rather than earlier. If better decisions can be made in the future, then there is a value to putting the decision off to a later date. The key point is that uncertainty and irreversibility should lead to a sequential decision-making process. If better information will emerge, regulators might seek an approach that preserves greater flexibility, at least if that approach is not too costly. The extent of the appropriate “irreversibility premium” depends on the situation.

### **III. Catastrophe and Sunk Costs**

Even under this account, the idea of irreversibility remains ambiguous. Let us consider two possible interpretations. Under the first, an effect is irreversible when restoration to the status quo is impossible or at best extremely costly, at least on a relevant timescale. Literal irreversibility is the extreme case. For example, the “decision not to preserve a rich reservoir of biodiversity such as the 60 million-year-old Korup forest in Nigeria is irreversible. The alteration or destruction of a unique asset of this type has an awesome finality.”<sup>32</sup> In other cases, we might be able to reverse the damage, but it would cost a great deal to do so – far more, let us suppose, than it would cost to delay the action that would cause the damage. If this is the appropriate interpretation of irreversibility, then it is an aspect of seriousness. A second interpretation, standard in the economic literature on options, sees irreversibility in terms of sunk costs. The two interpretations lead to different understandings of the problem of irreversibility and the Irreversible Harm Precautionary Principle.

#### **A. Irreversibility and Seriousness**

Under the first interpretation, the question is whether a clear line separates the reversible from the irreversible. Perhaps we have a continuum, not a dichotomy. Outside of the most extreme cases, the question is not whether some effect can be reversed, but instead at what cost. Note that areas that have been developed, or otherwise harmed, can often be returned to their original state, even if at considerable expense. Even lost forests can be restored. But sometimes the cost is high, even prohibitive, and sometimes restoration is literally impossible.

Consider in this regard the mortality effects of certain environmental harms. If air pollution would kill 200 people a year, or if climate change would produce tens of thousands of deaths in India, those losses cannot be recovered. Even biological changes in the human body may not be reversible (whether or not they are associated with immediate or long-term harm). Some kinds of air pollution induce changes that endure for decades. In all of these cases, irreversibility is simply an aspect of seriousness. If 200 people will die from certain levels of pollution, the harm is more serious than if 200 people would

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<sup>32</sup> See Graciela Chichilnisky and Geoffrey Heal, *Global Environmental Risks*, 7 *J Econ Persp* 65, 76 (1993).

merely get sick. If air pollution induces biological changes, everything depends on the magnitude of the harm associated with those changes.

At first glance, these points do not create a serious problem for the Irreversible Harm Precautionary Principle. The extent of the precaution should depend on the size of the harms and the cost and burden associated with preventing or (if possible) reversing them. If climate change cannot be reversed at all, we should take more aggressive precautions than we would if it can be reversed only at great expense, monetary or otherwise -- and if it can be reversed only at great expense, we would take more precautions than we would if it would be easy to reverse it.

But there is a conceptual difficulty here, which is that *whether a particular act is "irreversible" depends on how it is characterized*. Any death, of any living creature, is irreversible, and what is true for living creatures is true for rocks and refrigerators too; if these are destroyed, they are destroyed forever. And because time is linear, every decision is, in an intelligible sense, irreversible. If a couple goes on vacation in Greece in July of a certain year, that decision cannot be reversed, and what else might have been done at that time will have been permanently lost. If government builds a new highway in upstate New York in May, that particular decision will be irreversible; nothing else will be done with that land in May, even though the highway can be later replaced or eliminated. This is the sense in which "irreversibility" depends on how the underlying act is characterized. If we characterize it narrowly, to be and to do precisely what it is and does, any act is irreversible by definition.

Environmentalists who are concerned about irreversibility have something far more particular in mind. They mean something like a large-scale alteration in environmental conditions -- one that imposes permanent, or nearly permanent, changes in those conditions. It should be clear that irreversibility in this sense is not a sufficient reason for a highly precautionary approach. At a minimum, the irreversible change has to be for the worse, and it must also rise to a certain level of magnitude. A truly miniscule change in the global temperature, even if permanent, would not justify expensive precautions if it is benign or if it imposes little in the way of harm. For this reason, it is tempting to understand the idea of irreversibility, for environmental purposes, as inseparable from that of seriousness. A loss of a wisdom tooth is irreversible, but not a reason for particular precautions on behalf of wisdom teeth; a loss of an extremely small forest, with no wildlife, hardly justifies an especially aggressive principle, even if that loss cannot be reversed. A loss of a large forest, with a lot of wildlife, is a very different matter.

At first glance, then, irreversibility matters only because of its connection with the magnitude of the harm; irreversibility operates as a kind of amplifier. And if irreversibility in environmental protection is to be analyzed in that way, then an Irreversible Harm Precautionary Principle is really part of a Catastrophic Harm Precautionary Principle, or at least a Significant Harm Precautionary Principle. If so, the Irreversible Harm Precautionary Principle is important and must be taken into account, and helps illuminate the idea of irreparable harm; but it is not especially distinctive. The principle is also vulnerable, some of the time, to the same objections that apply to the Precautionary Principle as a whole: Significant and even irreversible harms may well be on all sides of

risk-related problems, and a focus on one set of risks will give rise to others -- perhaps environmental risks as well.

## B. Irreversible Investments

Analysts of real options understand the idea of irreversibility in a different and technical way.<sup>33</sup> Irreversible investments are sunk costs—those that cannot be recovered. Examples include expenditures on advertising and marketing, or even capital investments designed to improve the performance of a factory. In fact the purchase of motor vehicles, computers, and office equipment is not fully reversible, because the purchase cost is usually significantly higher than the resale value. Examples of reversible investments include the opening of bank accounts and the purchase of bonds. The problem with an investment that is irreversible is that those who make it relinquish “the possibility of waiting for new information that might affect the desirability or timing of the expenditure, and this lost option value is an opportunity cost that must be included as part of the investment.”<sup>34</sup>

Many people agree that we should characterize, as irreversible harms, environmental effects that are both serious and extremely expensive and time-consuming to reverse. The idea might be in the same family as that of irreversible investments; there may even be an identity here. The key point is that if a highway is built through a park, or if a development project goes forward next to a beach, officials may lack the “information that might affect the desirability or timing of the expenditure,” and the lost option value is an opportunity cost. NEPA can be understood as directly responsive to that risk. It does impose a (potentially costly) delay, to be sure, but it freezes the status quo while enabling officials to obtain at least some of that information.

But again, this argument ignores an important point: *Irreversibility, in this sense, might lie on all sides*. We are dealing with irreversibilities, not irreversibility. Regulation that reduces one (irreversible) environmental risk might increase another such risk (environmental or otherwise). Efforts to reduce climate change and other dangers associated with fossil fuel use may lead to increased dependence on nuclear energy, which threatens to produce irreversible harms of its own; in China, nuclear energy has been actively defended as a way of combating climate change.<sup>35</sup> As with the Precautionary Principle in general,<sup>36</sup> so with the Irreversible Harm Precautionary Principle in particular: Measures that the principle requires, on grounds on safety and health, might well be prohibited on exactly those grounds.

There is a more general point. If steps are taken to reduce greenhouse gas emissions, capital costs will be incurred, and they cannot be recouped. Sunk costs are a familiar feature of environmental regulation, in the form of mandates that require technological change. We may well be dealing, then, with irreversibilities, not irreversibility. In some cases that

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<sup>33</sup> See Avinash Dixit and Robert Pindyck, *Investment under Uncertainty* 6 (Princeton 1994) (“When a firm makes an irreversible investment expenditure, it exercises, or “kills,” its option to invest. It gives up the possibility of waiting for new information to arrive that might affect the desirability or timing of the expenditure, and this lost option value is an opportunity cost that must be included as part of the investment.”).

<sup>34</sup> *Id.* at 6.

<sup>35</sup> See, for example, Ling Zhong, Note, *Nuclear Energy: China’s Approach Towards Addressing Global Warming*, 12 *Georgetown Intl Envir L Rev* 493 (2000).

<sup>36</sup> See Cass R. Sunstein, *Laws of Fear* (Cambridge 2005).

involve requests for a preliminary injunction, that is precisely the problem, as the Supreme Court has recognized.<sup>37</sup>

For some environmental questions, this point complicates the application of the Irreversible Harm Precautionary Principle. As Fisher writes for climate change, “it is not clear whether the conditions of the problem imply that investment in control ought to be slowed or reduced, while waiting for information needed to make a better decision, or that investment should come sooner to preserve the option to protect ourselves from impacts that may be revealed in the future as serious or even catastrophic.”<sup>38</sup> It is for this reason that some observers have concluded that the existence of uncertainty and irreversibility argue for *less*, not more, in the way of investments in reducing greenhouse gas emissions. Those investments may themselves turn out to be irreversible. Everything depends on the likelihood and magnitude of the losses on all sides.

Nothing said here supports the increasingly implausible view that the right approach to climate change is adequately captured in the area of “wait and learn.” That approach will not make much sense if we might lose a great deal by virtue of waiting. There is good reason to believe that the irreversible losses associated with climate change do indeed justify the irreversible losses associated with greater investments in emissions reductions, world-wide. In that sense, steps to reduce greenhouse gas emissions, right now, can be understood as motivated by the same principles that sometimes justify the issuance of preliminary injunctions. My conclusion is that if irreversibility is defined in standard economic terms, pointing to the value of preserving flexibility for an uncertain future, it provides a distinctive and plausible understanding of the Irreversible Harm Precautionary Principle. As we will soon see, this understanding also helps explain some of the most important functions of NEPA.

#### IV. Incommensurability and Uncertainty

The discussion thus far misses something important. When people say that the loss of a loved one, a pristine area, or a species is irreversible, they do not merely mean that the loss is grave and that it takes a lot to provide adequate compensation. They mean that what is lost is *incommensurable* – that it is qualitatively distinctive, and that when we lose it, we lose something that is unique. In this regard, John Stuart Mill’s objections to Bentham’s conception of utilitarianism are worth quoting<sup>39</sup>:

Nor is it only the moral part of man's nature, in the strict sense of the term – the desire of perfection, or the feeling of an approving or of an accusing conscience -- that he overlooks; he but faintly recognizes, as a fact in human nature, the pursuit of any other ideal end for its own sake. The sense of honour, and personal dignity -- that feeling of personal exaltation and degradation which acts independently of other people's opinion, or even in defiance of it; the love of beauty, the passion of the artist; the love of order, of congruity, of consistency in all things, and conformity to their end; the love of power, not in the limited form of power over other human beings, but abstract power, the power of making our volitions effectual; the love of action, the thirst for movement and activity, a principle scarcely of less influence in human

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<sup>37</sup> *Winter*, 555 US at 14–15.

<sup>38</sup> Fisher, *Uncertainty* (cited in note 30).

<sup>39</sup> See John Stuart Mill, “Bentham,” in *Utilitarianism and Other Essays* 132 (Alan Ryan ed., Penguin 1987).

life than its opposite, the love of ease. . . . Man, that most complex being, is a very simple one in his eyes.

For those who emphasize incommensurability, the central claim is that human goods are diverse and that we do violence to our considered judgments about them when we line them up along a single metric.<sup>40</sup> Suppose, for example, that a species of tigers or elephants is lost. People do not value an endangered species in the same way that they value money; it is not as if a species, a beach, a friendship, or a child is indistinguishable from specified monetary sums. If we see species, beaches, friendships, and children as equivalent to one another, or to some amount of money, we will have an odd and even unrecognizable understanding of all of these goods. When people object to the loss of a species or a beach, and contend that the loss is irreversible, they mean to point to its permanence, and to the fact that what has been lost is not valued in the same way, or valued along the same metric, as money.

This claim should not be confused. Some goods have infinite value, in the sense that people would spend all they have to preserve them. At the same time, people are willing to make tradeoffs among qualitatively diverse goods, and they do so all the time. We will pay a certain amount, and no more, to be able to protect members of an endangered species or to visit the beach, or to help preserve it in a pristine state; we will not pay an infinite sum to see our friends, or even to maintain our friendships; we will take some precautions, but not others, to protect our children. The emphasis on incommensurability is not meant to deny that tradeoffs are made. The point is only that the relevant goods are not fungible. It follows that when a loss is deemed irreversible, one reason is that it is qualitatively distinctive and not fungible with other human goods. Many of those who are concerned about irreversible harms tend to stress this point.

This claim offers a distinctive understanding of what is meant by the idea of irreparable harm. When losses are said to be irreparable, it is sometimes because of the uniqueness of what is lost. Again, the need for trade-offs remains important. A pristine area may be incommensurable with money, and with others things that matter, but we do not attempt to pay an infinite amount to protect it. The claim about irreversibility is not meant to deny this point. What is gained by an understanding of incommensurability is a more vivid appreciation of why certain losses cannot be dismissed as mere “costs.” An Irreversible Harm Precautionary Principle, used in private decisions or democratic arenas, might be implemented with a recognition of the qualitative distinctiveness of many losses -- especially when those losses affect future generations.

Here too, however, it is important to see that precautionary steps may themselves impose incommensurable losses, not merely monetary ones. Recall, for example, that environmental protection of one sort may create environmental problems of another sort. If the diverse nature of social goods is to play a part in the implementations of an Irreversible Harm Precautionary Principle, it must attend to the fact that diverse goods may be on all sides.

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<sup>40</sup> Good discussions can be found in Elizabeth Anderson, *Value in Ethics and Economics* (Harvard 1993); Joseph Raz, *The Morality of Freedom* (Oxford 1985).

These are points about how to understand certain problems and debates, and not necessarily about actual practice in law. Because trade-offs are made among qualitatively diverse goods – as, for example, when people pay \$X, and no more, to avoid statistical mortality risks – the idea of incommensurability is not sufficient to support preliminary injunctions. That idea is best combined with an emphasis on uncertainty: Courts do not know how to value the relevant loss in monetary terms, and they will not know how to do that ex post. A harm might be irreparable in that sense; consider a preliminary injunction against a restriction on freedom of speech. In actual cases, claims about incommensurability are linked to claims about an epistemic problem faced by courts. They do not have the tools for accurate valuation.<sup>41</sup>

## V. Environmental Injunctions

For many years, some courts of appeals held that when environmental harm was alleged, district courts should adopt a presumption of irreparable damage and indeed a presumption in favor of injunctive relief.<sup>42</sup> In NEPA cases, the result was a likely injunction if the agency had failed to prepare an adequate environmental impact statement: “Irreparable damage is presumed when an agency fails to evaluate thoroughly the environmental impact of a proposed action.”<sup>43</sup> But what is the basis for this presumption? And what follows from it? Does it follow, for example, that the United States Navy must be enjoined from conducting weapons-training operations before it has obtained a permit to discharge ordnance into the sea?

In response to the last question, the Supreme Court offered a firm negative answer.<sup>44</sup> Rejecting the idea that environmental violations should give rise to automatic injunctions, the Court in *Weinberger v Romero-Barcelo* said that an injunction is an equitable remedy, subject to traditional balancing, and that it would “not lightly assume that Congress has intended to depart from established principles” permitting district courts to exercise their discretion.<sup>45</sup> Five years later, in *Amoco Production Co v Village of Gambell*, which involved the Alaska Native Claims Settlement Act, the Court underlined the point and expressly rejected the presumption of irreparable harm in environmental cases.<sup>46</sup> “This presumption is contrary to traditional equitable principles.”<sup>47</sup> Nonetheless, the Court stressed that environmental problems raise distinct issues, because “[e]nvironmental injury, by its nature, can seldom be adequately remedied by money damages and is often permanent or at least of long duration, i.e., irreparable.”<sup>48</sup> It follows

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<sup>41</sup> Note in this regard the close connection between the requirement of irreparable injury and the requirement that remedies available at law, such as monetary damages, are inadequate to compensate for the injury. The judgment of the inadequacy of damage remedies may help explain why an injury is irreparable.

<sup>42</sup> See *Thomas v Peterson*, 753 F2d 754, 764 (9th Cir 1985).

<sup>43</sup> *Save Our Ecosystems v Clark*, 747 F2d 1240, 1250 (9th Cir 1984). For general discussion, see Zigmund Plater, *Statutory Violations and Equitable Discretion*, 70 Cal L Rev 524 (1982).

<sup>44</sup> See *Weinberger v Romero-Barcelo*, 456 US 305 (1982).

<sup>45</sup> *Id.* at 313.

<sup>46</sup> *Amoco Production Co*, 480 US at 544–45.

<sup>47</sup> *Id.* at 544.

<sup>48</sup> *Id.*

that if an environmental injury is likely, “the balance of harms will usually favor the issuance of an injunction to protect the environment.”<sup>49</sup>

When courts of appeals spoke, in the 1980s, in terms of a presumption in favor of injunctive relief, they might be understood as adopting a version of the Irreversible Harm Precautionary Principle -- assuming that environmental harm is irreversible in the relevant sense, and requiring a strong showing by those who seek to proceed in the face of that harm. This interpretation helps to explain the simplest exception to the lower courts’ presumption: cases in which “irreparable harm *to the environment* would result if such relief were granted.”<sup>50</sup> If, for example, an injunction against the use of a logging road would prevent the removal of diseased trees and hence allow the spread of infection through national forests, no injunction would issue.<sup>51</sup>

Here, then, is a clear recognition of the existence of environment-environment tradeoffs, in a way that requires a qualification of any Irreversible Harm Precautionary Principle. And when the Supreme Court rejected the presumption, it did so in favor of traditional equitable balancing, in a way that recognized that serious harms, and perhaps irreversible harms, are on all sides. But even in doing so, the Court endorsed a kind of Irreversible Harm Precautionary Principle through its explicit recognition that environmental injury “is often permanent or at least of long duration.” And as noted, Justice Breyer offered a distinctive, NEPA-inflected understanding of the risk, finding irreparable harm not in an injury to the plaintiff or the environment, but in a failure to consider environmental considerations before deciding whether and how to proceed.

In latter cases, the Court has severely qualified these ideas.<sup>52</sup> In one of those cases, *Monsanto Co. v. Geertson Seed Farms*,<sup>53</sup> the Court disapproved of decisions that “presume[d] that an injunction is the proper remedy for a NEPA violation except in unusual circumstances.”<sup>54</sup> The Court explained that there is nothing in NEPA that allows courts considering injunctive relief to put their “thumb on the scales.”<sup>55</sup> The Court emphasized the need for irreparable harm, understood in concrete terms, rather than in terms of abstract risks, and it has not squarely explored the implications, made relevant by NEPA, of a failure to freeze the status quo to allow the requisite consideration.<sup>56</sup> And notwithstanding its seemingly categorical pronouncements, existing doctrine remains in some flux.

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<sup>49</sup> *Id.*

<sup>50</sup> *People of Village of Gambell v Hodel*, 774 F.2d 1414, 1424 (9th Cir 1985) (emphasis in original).

<sup>51</sup> *Alpine Lakes Protection Society v Schlapfer*, 518 F.2d 1089 (9th Cir 1975); *Thomas*, 753 F.2d at 764 n 8.

<sup>52</sup> See *Winter*, 555 US at 21–32; *Monsanto Co.*, 561 US at 156–66.

<sup>53</sup> 561 US 139, 157 (2010). For an interesting discussion in the context of the Endangered Species Act, where the law remains disputed, see *Cottonwood Environmental Law Center v U.S. Forest Service*, 789 F.3d 1075 (2015). The leading case is *TVA v. Hill*, 437 U.S. 153 (1978).

<sup>54</sup> *Monsanto Co.*, 561 US at 157.

<sup>55</sup> *Id.*

<sup>56</sup> See, for example, *Winter*, 555 US at 29–32. In the same vein, see *Sierra Club v US Dept of Agriculture*, 841 F Supp 349, 358-59 (DDC 2012).



In one of the key cases, *Winter v Natural Resources Defense Council*, Justice Breyer wrote separately so as to recapitulate his concerns as a court of appeals judge, noting, “NEPA seeks to assure that when Government officials consider taking action that may affect the environment, they do so fully aware of the relevant environmental considerations.”<sup>57</sup> It follows that “when a decision to which EIS obligations attach is made without the informed environmental consideration that NEPA requires, much of the harm that NEPA seeks to prevent has already taken place.”<sup>58</sup> That means that the “absence of an injunction thereby threatens to cause the very environmental harm” against which NEPA was designed to guard.<sup>59</sup> To date, the Court as whole has not engaged in Justice Breyer’s argument, and for that reason it remains on the table.

Even Justice Breyer agreed that in NEPA cases, preliminary injunctions should not issue as a matter of course; that view would endorse the Irreversible Harm Precautionary Principle in its crudest form. Balancing is required. Sometimes injunctions will themselves impose serious and perhaps irreversible harm, and sometimes the risk to the environment is trivial. But in NEPA cases, it continues to make sense to consider, as a relevant factor, the risk that an inadequately informed decision to proceed will alter the status quo -- ensuring that once an environmental impact statement is produced, it will be too late to have a meaningful effect on the outcome. If delay is not exceedingly costly, and if the risk of environmental harm is serious, injunctive relief is appropriate for NEPA violations. An understanding of the risk of irreversibility helps to explain why.

### **Conclusion: Ethics and Economics**

There is a coherent and distinctive Irreversible Harm Precautionary Principle, which takes the form of a willingness to pay a premium to freeze the status quo and to maintain flexibility for the future, while new information is acquired. In many settings, it makes sense to pay for an option to avoid a risk of irreversible losses. We can find an implicit understanding of option value in the emphasis on irreversibility in NEPA and other federal statutes, along with many international agreements. We can also obtain new insights into the time-honored idea of irreparable harm through the lens of irreversibility, especially in environmental cases.

In some cases, irreparable harm comes in the form of a large, qualitatively distinctive injuries, which are exceedingly difficult to turn into monetary equivalents (either before or after the fact). In some cases, irreparable harm is associated with the elimination of option value. Recall the demonstration by Arrow and Fisher that if a project produces “some irreversible transformation of the environment, hence a loss in perpetuity of the benefits from preservation,” then it is worth paying something to wait to acquire the missing information. For that reason, “the expected benefits of an irreversible decision should be adjusted to reflect the loss of options it entails.”<sup>60</sup>

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<sup>57</sup> *Winter*, 555 US at 35.

<sup>58</sup> *Id.*

<sup>59</sup> *Id.*

<sup>60</sup> *Id.* at 319.

The issuance of a preliminary injunction can be seen as reflecting such an adjustment. In some cases, it reflects an understanding that the environmental loss is incommensurable with money, not in the sense that it is infinitely valuable, but because it is qualitatively distinct. To be made workable for law, that understanding must be combined with an emphasis on the epistemic problem faced by courts; consider the challenge of valuation stemming from loss of a species or a pristine area.

We have also seen that an emphasis on irreversibility will sometimes argue in favor of delaying, rather than accelerating, environmental protection. There may be irreversible losses, in one or another sense, on both sides. Everything depends on the magnitude and likelihood of the relevant effects. Courts need to assess both of these in order to know how to proceed. But it makes sense to say that in the NEPA context, preservation of the status quo may be necessary to avoid a distinctive risk made relevant by that statute. I speculate that an understanding of this point bears on the meaning of the irreparable harm standard in many contexts, including freedom of speech, privacy, and discrimination on the basis of race and sex.