Global Compensation for Oil Pollution Damages: The Innovations of the American Oil Pollution Act

James Boyd

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Resources for the Future
1616 P Street, NW
Washington, D.C. 20036
Telephone: 202–328–5000
Fax: 202–939–3460
Internet: http://www.rff.org

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Abstract

Via technology and operations standards, U.S. regulation exerts an important influence over worldwide marine safety standards. But in addition, several other aspects of U.S. law deserve wider international consideration and adoption. First, the Oil Pollution Act's natural resource damage provisions are an innovative and effective way to deter marine pollution and provide for the restoration of injured ecological resources. Second, the relatively strict financial requirements imposed on marine transporters help ensure that polluters, rather than the public, pay if damage is caused. Liability and financial responsibility rules are not unknown in other countries. But the United States has a longer history with implementation and applies its rules more expansively. As both environmental concerns and global marine trade flows increase, U.S. experience with these rules will be instructive to other nations contemplating oil pollution reforms.

Key Words: Oil Pollution Act, Natural Resource Damages, Environmental Liability, Financial Assurance, Financial Responsibility, Valuation

JEL Classification Numbers: K13, K32, Q38

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James Boyd*

1. Introduction

U.S. environmental regulation relies in large measure on polluter liability as both a deterrent and means to finance compensation for environmental damages. While most U.S. environmental statutes also include *ex ante* operational, public process, and technological standards, the *ex post* imposition of liability is a distinctive feature of the American approach to regulation. Other nations employ liability, but no other nation as frequently or drastically imposes liability damages on the private sector. This paper describes the use of liability to deter and compensate for a particular kind of damages: those arising from marine and coastal oil and hazardous waste spills.

Liability for environmental damages is strict under both U.S. common law and the major environmental statutes. Unlike fault-type liability rules, strict liability imposes the full burden of environmental costs on the pollution generator, independent of any precautions taken. In principle, strict liability leads to the internalization of otherwise externalized costs. Cost internalization is desirable for both distributive and normative reasons. Strict liability serves distributive goals by providing compensation to victims. It serves normative ones by creating financial incentives that lead to optimal levels of deterrence.[1]

The principal law governing U.S. oil spills is the Oil Pollution Act (OPA), enacted in 1990. The law includes a suite of requirements designed to improve the safety of vessels and oil transport facilities, including technology and reporting requirements. The law also makes

* Boyd is Senior Fellow and Director, Energy and Natural Resources Divison, Resources for the Future, Washington DC (boyd@rff.org).

1 See William Landes and Richard Posner, *The Economic Structure of Tort Law* (Boston: Harvard University Press, 1987) for a history of the development and justifications for the theory of strict liability. Strict environmental liability is also mandated by statute, as in the Superfund amendments.

operators liable for three broad classes of costs: response and cleanup costs, damages to private property, and damages to public natural resources. Similar in impact are regulations derived from CERCLA, the Superfund law that governs vessel-related hazardous substance releases. Because CERCLA liability parallels oil pollution liability under OPA for marine spills, regulations deriving from both laws will be discussed.

This paper will focus on two aspects of OPA and CERCLA compensation law that are particularly distinctive. The first is the creation of liability for damages to public natural resources. Natural resource damage (NRD) liability is the most distinctive and complex aspect of the compensation issue. Other kinds of compensation—cleanup and response costs and damages to private property—are more common in other legal systems and more straightforward to calculate. Cleanup and response costs are the costs of minimizing an oil release and removing contamination from waters and shoreline. Property damages are damages to real estate, other property, or income.[2] These kinds of damages are relatively conventional and easy to calculate, since damages can be easily quantified in dollar terms. Natural resource damages are a more novel and challenging aspect of compensation law. In particular, NRDs require the government to calculate the social loss associated with damages to resources that are not privately owned or traded in markets. Without private ownership and trade there is no clear way to derive the social value of damages (by inferring them from prices, for example). For this reason, NRD liability is controversial and raises a host of legal and technical issues, as will be discussed in Section 3. The legal history of the NRD concept will be reviewed, as will the government's evolving approach to the calculation of such damages. The paper will also summarize the frequency and scale of NRD damages relative to other damages associated with marine oil spills.

The second distinctive aspect of OPA is its approach to funding cleanup and restoration. OPA requires financial assurance as a pre-condition for operation. These requirements are akin to mandatory insurance or minimum capitalization requirements and are designed to ensure that responsible parties have the funds necessary to pay for damages. OPA also includes an Oil Spill Liability Trust Fund designed to pay for costs that are not immediately recoverable from private, responsible parties. Section 5 discusses these financing issues.

[2] The government can recover lost government revenue (for example, lost fishing license revenue due to damage to a fishery).

Before describing OPA and its NRD provisions, a description of the broad legal environment is necessary. First, vessels can be liable for damages, including NRDs, under several U.S. statutes in addition to OPA. In particular, the Clean Water Act (CWA) and the National Marine Sanctuaries Act (NMSA) provide legal authority for the collection of vessel-related NRDs. Second, NRDs are a part of other environmental statutes that do not apply to vessels. The Superfund law (CERCLA), for example, imposes NRDs for damages associated with hazardous waste sites, vessels carrying hazardous cargo (other than oil), and some releases to inland waterways. Because OPA and CERCLA are the principal statutes governing vessel liability, they will be the focus of this paper.

OPA is a potential model for other nations' approaches to marine oil and hazardous waste pollution. As will be argued, the imposition of NRDs is an important innovation that addresses a global need: restoration of damaged ecological services and acknowledgement that natural resources have significant economic value that should be included in the calculus of damages. Another important component of deterrence that is worthy of emulation is mandatory financial requirements. Financial assurance promotes deterrence and compensation by fostering polluter cost internalization. It also harnesses the expertise of financial intermediaries, such as insurers, with capabilities in risk analysis and management. NRDs and financial responsibility requirements are what are most distinctive about U.S. maritime spill law and also what are most worthy of emulation by other countries.

2. OPA and U.S. Natural Resource Damages Law

This section describes the legal basis for natural resource damage liability under U.S. law, with particular emphasis on NRDs under OPA and CERCLA. Several U.S. environmental statutes establish liability for injury to natural resources. The Deepwater Port Act of 1974 and the Clean Water Act amendments of 1977 introduced NRD liability to federal law.[3] Subsequent to,

[3] For the CWA, see 33 USC 1251 et seq. Section 311 of the CWA regulates the discharge of oil and other hazardous substances into navigable waters, allows the government to remove the substance, and holds the responsible parties liable for that removal. The removal cost is defined to include "costs for restoration or replacement of natural resources damaged or destroyed." 33 USC 1321. The Deepwater Port Act of 1974, which preceded the CWA, established liability for damages to natural resources to be recovered by a federal trustee and used for restoration. 33 USC § 1501–1524, 1982.

and in most ways superseding, those statutes, liability for NRDs was established under CERCLA,[4] OPA, [5] and the National Marine Sanctuaries Act.[6] These latter statutes significantly expanded the reach and amounts of potential NRD liability. OPA, for example, significantly increased prior liability limits and allowed for the recovery of income lost because of damage to public resources.[7] As noted above, liability for natural resource (and all other) damages under the statutes is strict in that liability is imposed irrespective of precautions, care, safety, or other measures undertaken to guard against injury. Among potentially responsible parties (PRPs), liability is joint and several.[8] There is a statute of limitations for the recovery of damages, and a causal link between the defendant's actions and a natural resource injury must be established.[9]

Also, many U.S. states have their own natural resource damage laws.[10] In fact, more than half the states have independent statutory authority to pursue NRDs.[11] In some cases, the liabilities arising under state law can significantly expand upon federal liability. For example, in

[4] Section 107 of CERCLA establishes NRD liability and authorizes federal trustees to recover damages for assessing and correcting natural resource injuries. 42 USC 9607(f)(1).

[5] Section 1002 of the OPA establishes liability for "injury to, destruction of, loss of, or loss of use of natural resources." 33 USC 2702(b)(2)(A).

[6] The NMSA uses the same definition of natural resource damages as OPA, 16 USC 1432. Section 1443 establishes liability and authorizes civil actions to pursue cost recovery.

[7] The prior limitation on state-imposed liability was created by the Federal Limitation of Liability Act of 1851, 46 USC § 183–189. OPA contains liability limits of its own, as discussed in Section 5.2 *infra*, though these can be breached if the vessel operator is found to have been grossly negligent.

[8] 33 CFR § 138.30(a). OPA and CERCLA do not explicitly provide for joint and several liability, though joint and several liability is strongly implied (CERCLA, 42 USC 9607; OPA 33 U.S.C. 2702(d). Court interpretations of the somewhat vague statutory language, however, have established joint and several liability as the rule when damages are indivisible. For a CERCLA case, see *United States* v. *Chem-Dyne Corp.*, 572 F. Supp. 802 (S.D. Ohio 1983) at 810–811. For an OPA case, see *Sun Pipe Line Co.* v. *Conewago Contractors, Inc.*, 1994 WL 539326, *8 (M.D. Pa. 1994), citing 136 *Cong. Rec.* H6933-02, H6936 (daily ed. August 3, 1990).

[9] The statute of limitations for filing an NRD claim is three years from completion of cleanup at an NPL site, or three years after discovery of NRDs at a non-NPL hazardous waste site. CERCLA, 42 USC 9612(d)(2); OPA, 33 USC 2712(h)(2).

[10] In some states—Pennsylvania, for example—even municipalities can sue for NRDs. 35 PA. Cons. Stat. Ann. 6020.507(a).

[11] As of 1995, one survey found that 28 states had passed laws authorizing NRD recovery. Environmental Law Institute, *An Analysis of State Superfund Programs: 50-State Study, 1995 Update.* ELI Project #941724. p. 46. For a more recent but somewhat less complete state survey, see Association of State and Territorial Solid Waste Management Officials, *Survey of State Remedial Program Activities in Natural Resource Damages*, February 1997, at http://www.astswmo.org/Publications/ascii/nrdsur.txt.

contrast to federal NRD law, state NRD laws do not always cap liability.[12] In most cases, however, state claims are pursued through federal law,[13] and at least until the mid-1990s, few state NRDs had been recovered.[14]

2.1 What Is a Natural Resource Damage?

In physical terms, natural resource damages are damages to land, fish, wildlife, biota, air, water, groundwater, and other resources.[15] Physical injuries can take a variety of forms but typically relate to adverse changes in the health of a habitat or species population and in the underlying ecological processes on which they rely.[16] In legal terms, the definition of NRDs is restricted to resources that are owned, controlled, or managed by federal, state, or other governmental entities, including foreign governments.[17] Damages to pure private property interests are not considered natural resource damages under U.S. law. However, the definition of natural resources is not limited to government-owned resources. What must be demonstrated is a "substantial degree of government regulation, management, or other form of control over the property" that is injured.[18] Accordingly, injuries to natural resources on or associated with private property can lead to NRD claims.

Defendants found liable for NRDs face three primary damage components: first, the cost of resource restoration to baseline conditions; second, compensation for "interim losses," that is,

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[12] New Jersey is an example. NRD assessments are required under New Jersey law during any remedial investigation of a hazardous waste site. NJAC 7:26E-4.7. The Spill Compensation and Control Act establishes liability for NRDs, with no cap on liability. NJSA 58:10-23.11(u)(b)(4). In other respects the state's law is similar to the federal, such as the definition of natural resource injury.NJAC 7:26E-1.8.

[13] States may recover NRDs under federal authority (CERCLA) at non-NPL sites within their jurisdictions. See Association of State and Territorial Solid Waste Management Officials, note 11 *supra,* which found that 30 of 38 states responding pursued NRD claims through federal law.

[14] According to the ELI report, note 11 *supra,* as of 1995, only eight states had recovered NRD claims under their statutes. However, it is likely that this number has expanded significantly in recent years.

[15] OPA 33 USC § 2701(20); CERCLA 42 USC § 9601(16).

[16] 15 CFR 990.52. "Potential categories of injury include, but are not limited to, adverse changes in: survival, growth, and reproduction; health, physiology, and biological condition; behavior; community composition; ecological processes and functions; physical and chemical habitat quality or structure; and public services."

[17] CERCLA § 101(16); OPA § 1001(20).

[18] Qualifying resources are "resources the government substantially regulates, manages, or controls"; see *Ohio* v. *United States Department of Interior,* 880 F.2d 432 (D.C. Cir. 1989), at 460–461.

the lost value of injured resources pending full restoration; and third, the reasonable cost of the damage assessments themselves.[19] In some cases, the acquisition of "equivalent resources" can be used as a substitute for restoration.[20] NRDs can also arise from natural resource injuries that have not yet occurred. Under both OPA and CERCLA, the government has authority to respond to, and recover costs for, "threatened" releases of oil or hazardous substances that pose a danger to natural resources.[21]

In economic terms, the goal of federal NRD liability is to "make the environment and public whole" following a pollution event.[22] In principle, this is straightforward and consistent with legal and economic theories of deterrence that emphasize the desirable consequences of social cost internalization by polluters. In practice, the determination of compensation amounts can be quite difficult, as will be discussed in Section 3.

To further clarify the nature of natural resource damages, it is useful to distinguish between remediation and restoration. Remedial activities are cleanup actions designed primarily to reduce threats to public health. Restoration activities are directed at the recovery of resources themselves. This distinction is clearly evident in CERCLA. Remedial actions are typically undertaken only if a site is placed on the National Priorities List (NPL).[23] The criteria for placement on this list emphasize threats to public health. In contrast, CERCLA restoration authority is the authority to restore or replace natural resources to the conditions that would have existed without the hazardous release.[24]

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[19] CERCLA § 101(6); OPA § 1001(5), § 1002(b)(2).

[20] 33 USC 2706(d)(1)(A).

[21] 33 USC 2702(a); 42 USC 9606(a).

[22] 15 CFR 990.53.

[23] The U.S. Environmental Protection Agency (EPA) can mandate certain actions, such as temporary relocation of residents, even if a site does not appear on the NPL. Under the National Contingency Plan, however (which establishes rules governing the response to hazardous releases), remedial actions may be taken only at sites on the NPL. 40 CFR 300.68(a).

[24] CERCLA § 107(f)(1); 40 CFR § 300.615(c)(3),(4).

2.2 Common Law Foundations

The public trust doctrine is the common law foundation upon which liability for NRDs is based.[25] Well before the passage of the relevant federal statutes, natural resource damages were collected under common law.[26] In fact, the public trust doctrine is a legal concept from Roman law, applied historically to navigation and fishing rights. The doctrine held that the public (usually commercial) interests in navigable waters superseded any private claim to them.[27] The doctrine has evolved in U.S. common law to represent the more general notion that the public has an explicit legal interest in the nation's natural resources.[28] Under U.S. law, these interests are now understood to include the preservation of noncommercial public interests, such as recreation.[29] As a result, citizens can challenge private or government actions that threaten the public's interest in natural resources.[30] The same principle can be used to compel administrative actions by the government to protect resources under their care.[31] Natural resources are often considered to be "held in trust" by the federal or state government. A government's responsibilities as trustee can be challenged by private citizens.[32]

Common law tort and contract principles have also been used to gain private recovery for natural resource injury. When individuals have a significant interest in public resources, they can sue to recover loss of those resources. A common example is when water pollution closes a

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[25] See James Power, "Reinvigorating Natural Resource Damage Actions through the Public Trust Doctrine," 4 *NYU Environmental Law Journal* 418 (1995).

[26] *State* v. *Jersey Central Power & Light Co.*, 308 A.2d 671 (N.J. Super. Ct. Law Div 1972), reversed on other grounds, 351 A.2d 337 (N.J. 1976).

[27] Joseph Sax, "The Public Trust Doctrine in Natural Resource Law: Effective Judicial Intervention," 68 *Michigan Law Review* 471, 475 (1970). See *Illinois Central Railroad* v. *Illinois,* 146 U.S. 387 (1892) for an early statement of the principle in U.S. law.

[28] See *National Audubon Society* v. *Superior Court of Alpine County,* 658 P.2d 709, 719 (Cal. 1983).

[29] As in *Matthews* v. *Bay Head Improvement Association,* 471 A.2d 355, 363 (N.J.), cert. denied, 469 U.S. 821 (1984); *Marks* v. *Whitney* 491 P.2d 374 (Cal. 1971), concluding that it is in fact unnecessary to define precisely what public use is threatened by a natural resource damage.

[30] Citizens can sue "for the purpose of vindicating the public trust," *State* v. *Deetz,* 66 Wis. 2d 1, 13, 224 N.W.2d 407 (1974).

[31] *Sierra Club* v. *U.S. Department of the Interior,* 376 F. Supp. 90 (N.D. Cal. 1974).

[32] For instance, Wisconsin holds the beds of its navigable waters in trust for the use and enjoyment of its citizens. *Muench* v. *Public Service Comm'n,* 261 Wis. 492, 501 53 N.W.2d 514 (1952).

commercial fishery, as in *Louisiana* v. *M/V Testbank*.[33] A nuisance action can be brought, usually by a state, but in some cases also by private citizens who can show some individualized injury to themselves.[34]

2.3 Administrative Issues

OPA and CERCLA govern NRDs arising from the release of oil and hazardous substances, respectively. When a release occurs, either the U.S. Environmental Protection Agency (EPA) or the U.S. Coast Guard (USCG) has authority over removal responses and other immediate actions. When oil or hazardous substances are released on land, CERCLA and OPA require EPA to investigate and respond. The USCG is responsible for releases taking place in coastal waters, including the Great Lakes. Authority for response to inland waterway releases is divided between EPA and USCG.[35] Technical response actions and other procedures to be followed in the event of a release are governed by what is called the National Contingency Plan.[36]

A different set of agencies is responsible for longer-term damage assessment and restoration activities. Restoration, assessment, and settlement of NRD claims are undertaken by federal, state, and tribal trustees. Only governmental trustees can seek natural resource damages. Private persons do not have the right to assert claims for natural resource damage.[37] The principal federal trustees are the National Oceanic and Atmospheric Administration (NOAA) and

[33] 524 F. Supp. 1170, 1173 (E.D.La. 1981), aff'd 752 F.2d 1019 (5th Cir. 1985), cert. denied, 477 U.S. 903 (1986). In legal parlance, the issue decided in *Testbank* was whether the "contractual relational economic loss" suffered by the plaintiffs was recoverable in tort. The case involved the collision of two vessels with the release of toxic chemicals. The pollution led to the government's closure of an area used for commercial fishing and in turn to a commercial loss for the affected fishermen.

[34] Cases where private plaintiffs successfully brought claims of public injury include *International Paper Co.* v. *Ouellette*, 479 U.S. 481 (1987); *Middlesex County Sewerage Auth.* v. *National Sea Clammers Ass'n*, 453 U.S. 1 (1981).

[35] 40 CFR 300.5.

[36] 40 CFR 300.

[37] *Artesian Water Co.* v. *Government of New Castle County*, 851 F.2d 643 (3rd Cir. 1988).

the Department of Interior (DOI).[38] Generally speaking, NOAA is the federal trustee for claims arising under OPA, and DOI for claims arising under CERCLA. Two sets of rules guide the agencies' respective NRD assessment procedures.[39] These rules also act as a blueprint for the determination of appropriate restoration actions. Accordingly, the damage assessment rules, together with the analysis of a specific site, largely determine the nature and scale of NRD recoveries.[40]

There is no direct private right of action to recover NRDs under federal law.[41] However, common law principles and federal administrative law extend the scope of possible citizen action.[42] The Administrative Procedures Act (APA) allows citizens to challenge government administrative actions.[43] Governmental actions affecting aesthetic and environmental interests associated with the use and enjoyment of natural resources are well within APA's ambit.[44] A central issue in such cases is the degree to which a private plaintiff can show a concrete, individual harm to a legally protected interest. Injury to a natural resource alone is an insufficient

[38] The Departments of Agriculture, Defense, and Energy can also be trustees. 40 CFR § 300.600. State and tribal trustees vary and are designated by the governor of each state or by tribal chairmen. 40 CFR § 300.605, 610. Under OPA, foreign officials can also act as natural resource trustees for foreign resources. OPA § 1006(a)(4),(b)(5).

[39] 15 CFR 990 (the NOAA regulations); 43 CFR 11 (the DOI regulations).

[40] This should not be taken to suggest that recoveries are easily calculated via reference to an objective, unambiguous schedule of damages. The legal and technical uncertainties surrounding NRD assessment imply that PRP–trustee bargaining, as much as objective criteria, will determine the ultimate scale of financial damages. The damage assessment rules are discussed in more detail in Section 4.

[41] Gregg Spyridon and Sam LeBanc, "The Overriding Public Interest in Privately Owned Natural Resources: Fashioning a Cause of Action," 6 *Tulane Environmental Law Journal* 287 (1993), citing *Artesian Water Co.* v. *New Castle County*, 659 F.Supp. 1269, 1288 (D.Del. 1987), aff'd, 851 F.2d 643 (3rd Cir. 1988).

[42] See Barry Breen, "Citizen Suits for Natural Resource Damages: Closing a Gap in Federal Environmental Law," 24 *Wake Forest Law Review* 851 (1989).

[43] APA covers the breadth of federal agency action. "A person suffering legal wrong because of agency action, or adversely affected or aggrieved by agency action within the meaning of a relevant statute, is entitled to judicial review thereof." 5 USC 702.

[44] As in *Sierra Club* v. *Morton*, 405 U.S. 727 (1972), in which the plaintiff sued under the APA alleging that the U.S. Forest Service erred in granting a construction permit for a ski area adjacent to a national park. The Supreme Court's ruling held that "Aesthetic and environmental well-being, like economic well-being, are important ingredients of the quality of life in our society, and the fact that particular environmental interests are shared by the many rather than the few does not make them less deserving of legal protection through the judicial process," at 734 (though plaintiff's claim failed because of an inability to adequately demonstrate an injury-in-fact).

basis for such a claim.[45] Nevertheless, because so many government actions can have natural resource consequences, the scope for citizen-initiated action is potentially broad.

Moreover, most federal environmental statutes explicitly authorize citizen suits that can lead to injunctive relief and, in some cases, civil damages.[46] For example, although NRDs are not compensable to individuals under OPA, citizens can file suit to compel a federal agency to fulfill its role as a natural resource trustee.[47] Typically, such suits are barred when a government agency is considered to be diligently prosecuting an enforcement action

Numerous technical difficulties are associated with the calculation and application of natural resource damages, as discussed in the next section. But these difficulties should not obscure the fact that legal authority for the collection of NRDs is well established in the United States.

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[45] See *Lujan* v. *Defenders of Wildlife* 504 U.S. 555 (1992), which challenged several federal agencies' decisions relating to the use of federal lands. "Respondents mistakenly rely on a number of other novel standing theories…[such as] that any person using any part of a contiguous ecosystem adversely affected by a funded activity has standing even if the activity is located far away from the area of their use" (at 556).

But see Justice Blackmun's dissent: "As I understand it, environmental plaintiffs are under no special constitutional standing disabilities. Like other plaintiffs, they need show only that the action they challenge has injured them, without necessarily showing they happened to be physically near the location of the alleged wrong" (at 595).

[46] A recent Supreme Court case addressed the conditions under which a citizen suit can compel a defendant to comply with regulatory permit violations affecting recreational and aesthetic interests. Even though no environmental harm occurred, the permit violation itself was found to create an injury-in-fact subject to redress (the same issue confronted in *Lujan*, note 45 *supra*). *Friends of the Earth, Inc.* v. *Laidlaw Environmental Services, Inc.* 120 S. Ct. 693 (2000).

For a more detailed analysis, see Michael Healy, "Standing in Environmental Citizen Suits: *Laidlaw*'s Clarification of the Injury-in-Fact and Redressability Requirements," 30 *Environmental Law Reporter* 10455, 10465. "*Laidlaw* would thus appear to permit any person with a proper interest in a resource affected by pollution levels that are illegally high as a result of defendant's statutory violations to show injury-in-fact as long as the person feels injured by that higher level of pollution."

[47] 33 USC § 2706(g). "Review of actions by any Federal official where there is alleged to be a failure of that official to perform a duty under this section that is not discretionary with that official may be had by any person in the district court in which the person resides or in which the alleged damage to natural resources occurred. The court may award costs of litigation (including reasonable attorney and expert witness fees) to any prevailing or substantially prevailing party."

3. Calculating Damages

Natural resource damages are an established legal concept with a clear economic rationale. In practice, however, NRDs raise a host of difficult issues for regulators. By their nature, NRDs acknowledge that natural resources produce a collective social benefit. These benefits are distinct from benefits associated with private property interests. This means that the value of NRD-related ecological benefits is not typically revealed by market transactions. Instead, government trustees must calculate the lost social value using techniques that are technically challenging and sometimes socially controversial. This section describes the history of alternative NRD damage calculation methods, explores the technical issues involved with damage calculation, and reviews the current application of damage estimation methods.

As will be seen, there are two broad ways to calculate an NRD. The first is to measure the lost social benefits arising from the damage. Basing penalties on the lost social benefits is the correct and most precise way to "make the public whole." Unfortunately, it is also a difficult task. Measuring lost benefits requires extensive data and sophisticated ecological and economic assessment techniques. And many of the methods used to calculate lost benefits are subject to scientific debate. For a regulatory agency these characteristics are problematic, due both to cost and political acceptance. For these reasons, an alternative approach is increasingly employed: damages based on replacement cost. The focus of this approach is not on the determination of lost social benefits, but rather on the replacement of biophysical functions and the services they generate. For example, if an oil spill damages a seagrass bed the objective is to replace the seagrass and the services it provides, such as habitat for species that are commercially and recreationally valuable. The cost of replacement is the damage imposed. Ecological replacement costs should not be thought of as an "easy" task for regulators. But replacement costs are much easier to calculate than lost benefits.[48]

[48] For government reports that describe the practical advantages of replacement cost-based damages over lost benefit-based damages, see Texas General Land Office, Texas Parks and Wildlife Department, Texas Natural Resource Conservation Commission, NOAA, and the U.S. Fish and Wildlife Service, "Damage Assessment and Restoration Plan and Environmental Assessment for the Point Comfort/Lavaca Bay NPL Site Recreational Fishing Service Losses," 2001; and David Chapman, Nicholas Iadanza, and Tony Penn, "Calculating Resource Compensation: An Application of the Service-to-Service Approach to the Blackbird Mine Hazardous Waste Site," Damage Assessment and Restoration Program, NOAA Technical Paper 97-1, October 16, 1998.

3.1 The History of NRD Assessment

CERCLA and OPA directed the Department of Interior (DOI) and the National Oceanic and Atmospheric Administration (NOAA) to develop rules governing natural resource damage assessment. This section reviews the development of these procedures and outlines the basic determinants and methods used to value natural resource damage.

DOI first published damage assessment rules in 1986.[49] The rules established two basic procedures: Type A for small releases of oil and hazardous waste, and Type B for large and complex releases.[50] These original rules took a relatively narrow view of the types of injuries that were compensable, the scope of compensation, and the methods to be used in damage assessment. The rules strongly favored a market-oriented approach to damages and established a hierarchy of assessment methodologies. If there was a competitive market for the resource, a diminution in the resource's value (the damage) was to be captured by a price change. If this was inappropriate or impossible, standard appraisal methods were to be used. Only when neither of these was determined by the trustee to be appropriate would "nonmarket" procedures be used. In addition, the original DOI rules limited damage awards to the lesser of the resource's replacement cost or the diminution in use value associated with the injury.[51] Moreover, damages were not to include those associated with nonuse values (e.g., option, existence, or bequest values).

Two 1989 cases, *Ohio* v. *Department of Interior* and *Colorado* v. *Department of Interior*, forced DOI to revise those rules.[52] The revised rules were published in 1994. In *Ohio* the court ruled that CERCLA does not in fact mandate a least-cost approach to damages, thus invalidating the "lesser of" damage rule. Instead, the court strongly favored the use of restoration as the basis

[49] 61 FR 20609, 1986.

[50] CERCLA sec. 301(c)(2)(A–B). OPA, 33 USC 2706(d). Type A assessment procedures are used for small incidents with limited duration and cost.

[51] 43 CFR 11.35(b)(2–3), 1987. This "lesser of" damage rule is reflective of the common law standard for determination of tort damages.

[52] *Ohio* v. *Department of Interior* (880 F.2d 432, 442 [D.C. Cir. 1989]) and *Colorado* v. *Department of Interior* (880 F.2d 481 [1st Cir. 1989]). For the purposes of this analysis, the *Ohio* case is more important, since it related to Type B assessment procedures. The *Colorado* case came to broadly similar conclusions regarding the original DOI rules but relates primarily to the more limited Type A procedures.

for damages, even if restoration is more expensive than monetary estimates of lost use value.[53] Based on the ruling, the current regulations allow for damages based on diminution in value only in cases where restoration is infeasible or where restoration costs are judged "grossly disproportionate" in relation to lost benefit measures, including lost nonuse benefits. The *Ohio* court also invalidated the exclusive reliance on market-derived definitions of damage.

Under the current rules nonuse values such as option, existence, and bequest values are compensable.[54] The revised rules acknowledge that "the mere presence of a competitive market [for resources] does not … ensure the price will 'capture fully' the value of the resource."[55]

The statutes are careful to not limit damages to those that can be directly measured in markets or that are based on observable resource uses. Second, as long as the agencies' own damage assessment rules are adhered to, there is a "rebuttable presumption" of the analyses' correctness and legal validity.[56] Accordingly, the presumption provides agencies with considerable latitude in their choice of damage assessment methods. It has been suggested that Congress included the agency procedural advantage in OPA and CERCLA in order to expand the scale and applicability of NRDs beyond common law damage rules.[57] A remarkable aspect of both OPA and CERCLA is that they have given DOI and NOAA significant latitude to resolve these difficult valuation issues.[58]

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[53] The NRDA rules' current focus on the replacement cost of resources, rather than their estimated market value, is a direct outgrowth of these cases. H.R. Conf. Rep. No. 653, 101st Cong., 2d Sess. 108 (1990). Also, see discussion in Russell Randle, "The Oil Pollution Act of 1990: Its Provisions, Intent, and Effects," 21 *ELR News and Analysis* 10119 (1991).

[54] Compensable value includes "all of the public economic values associated with an injured resource, including use values and nonuse values such as option, existence, and bequest values." 56 FR 19760, April 29, 1991.

[55] 56 FR 19759, 1991.

[56] CERCLA § 107(f)(2)(C); OPA § 1006(e)(2).

[57] See Frederick Anderson, Natural Resource Damages, Superfund, and the Courts, in *Valuing Natural Assets: The Economics of Natural Resource Damage Assessment,* Raymond Kopp and V. Kerry Smith, eds. (Washington, DC: Resources for the Future, 1993). "[It is likely that], the rebuttable presumption was placed in the statute specifically in anticipation that the government would adopt regulations that would press well beyond traditional damage awards."

[58] It should be emphasized that the difficulties are not related to "financial" or "economic" issues alone. The physical determination of injury itself poses significant technical challenges. For example, it is difficult to establish baseline conditions given natural variability, and the possibility of preexisting contamination. Also, the biological impact of loss of a subset of a biological (species) on a larger community is highly uncertain. The incomplete loss of a community can allow for accelerated biological restoration. As a final example, toxicity measurements for a given release on a given population are themselves a source of uncertainty.

In 1996, NOAA followed the 1994 DOI rules with rules of its own, to be applied to assessments authorized under OPA.[59] The rules define the goals of compensation and establish procedures to assess injury, establish causality, and calculate damages. Damage settlement can be arrived at without precise adherence to the rules. Any settlement, however, requires adherence to the broader goals for compensation established by the rules.[60] Settlements that fail to adhere to these standards can be challenged.[61]

As noted above, the current emphasis is on restoration rather than a monetized estimate of lost benefits as the measure of damages. Although the "lesser of" rule has been abandoned, cost remains relevant to the determination of remedies. Technical feasibility and cost-effectiveness must be considered in the choice of restoration projects.[62]

In addition to restoration, however, the rules allow for compensatory damages, which relate to the loss in value experienced between the time of injury and full restoration. As the NOAA rules put it, the goal of the damage assessment is to "make the environment and public whole … [and is to be] achieved through the return of the injured natural resources and services to baseline and compensation for interim losses of such natural resources and services from the date of the incident until recovery."[63]

The NOAA rules provide trustees with wide latitude to choose among alternative valuation methodologies, including market price–based valuation methods, appraisal methods, hedonic analysis, and travel cost methods.[64] The aforementioned methods are associated with the estimation of use values. As noted earlier, however, the rules explicitly allow trustees to recover

[59] The rules are codified at 15 CFR 990 (the NOAA rules for OPA damages) and 43 CFR 11 (the DOI rules for CERCLA damages).

[60] 15 CFR 990.25. "Trustees may settle claims for natural resource damages... at any time, provided that the settlement is adequate in the judgment of the trustees to satisfy the goal of OPA and is fair, reasonable, and in the public interest, with particular consideration of the adequacy of the settlement to restore, replace, rehabilitate, or acquire the equivalent of the injured resources and services."

[61] See *Kennecott Utah Copper Corp.* v. *U.S. Department of Interior*, 88 F.3d 1191 (D.C. Cir 1996), in which the court rejected an inadequate NRD settlement and defined minimal standards that settlements must meet. In particular, the settlement failed to involve restoration, a conclusion the court felt was unwarranted given the trustees' limited analysis of options.

[62] 43 CFR 11.82(d).

[63] 15 CFR 990.10. For an example, see David Chapman, Nicholas Iadanza, and Tony Penn, "Calculating Resource Compensation: An Application of the Service-to-Service Approach to the Blackbird Mine Hazardous Waste Site," NOAA Technical Paper 97-1, October 16, 1998.

[64] 43 CFR 11.83.

lost nonuse values.[65] The estimation of nonuse values raises significant methodological concerns and is viewed with particular alarm by potentially liable parties. For this reason, an independent panel was convened in 1993 to assess the validity of the so-called contingent valuation (CV) methodology to measure nonuse values. The NOAA Panel established a set of guidelines for the use of CV methods and concluded that CV can provide a valid economic measure of value associated with resources people do not actually use but whose existence they may nevertheless value.[66] The rules now permit CV for estimating use and nonuse values but only when "no use values can be determined."[67]

3.2 The Challenge of Ecosystem Service Assessment

For more than 20 years, economists have been experimenting with methods to estimate the monetary value of non-marketed ecological services. For an even longer period of time ecologists and other natural scientists have been grappling with ways to describe biophysical processes and the impact of human activity on biophysical outcomes. NRD assessment requires both biophysical analysis and economic analysis of the services generated by biophysical functions. Because ecological and economic systems are complex, scientifically rigorous assessment is a challenge.

Economic valuation of natural resource damages is built on a foundation of biophysical assessment. Ecosystem structure and functions, as described and evaluated by ecological science, generate services valued by people. It is the services created by biophysical functions that yield social benefits. Ecological analysis, of course, is concerned with the biological, chemical, and

[65] 43 CFR 11.83; 15 CFR 990.30. "The total value of a natural resource or service includes the value individuals derive from direct use of the natural resource, for example, swimming, boating, hunting, or birdwatching, as well as the value individuals derive from knowing a natural resource will be available for future generations."

[66] The panel concluded that "[contingent valuation] produces estimates reliable enough to be the starting point of a judicial process of damage assessment, including passive-use values (i.e., nonuse values)." Report of the NOAA Panel on Contingent Valuation, 58 FR 4601, January 15, 1993, at 4610.

[67] 43 CFR 11.83(c)(2)(vii).

hydrological relationships that determine biological production.[68] An ecosystem's structure, such as size, vegetation, and boundaries, and its functional aspects, such as ability to absorb floodwater or remove contaminants from surface water, are biophysical contributors—as inputs—to the services the habitat generates. While economic and biological systems are clearly different in important respects, both economics and ecology seek to understand the activity or productivity of systems by understanding the systems' basic components and the functional relationships between those components.

The distinction between biophysical functions and ecosystem services can be defined in the following way: ecosystem services are the outcomes of biophysical functions that yield value to people. For example, the ability of wetlands to mediate extremes of flood and drought at a downstream location is a biophysical function. A service is created if the absorbed floodwater yields less damage to buildings, roads, and agriculture or if the higher flows in limited rainfall years support a recreational fishery. Even if an ecosystem rates highly in terms of a functional characteristic, that function may not provide a socially valued service.[69] As another example, any consideration of the value of lost commercial and recreational fishing opportunities due to an oil spill in coastal wetlands must understand the role of the wetlands in fishery population dynamics. Leaving economic issues aside, ecological science is itself an evolving field where biological and physical interactions are often poorly understood, particularly where spatial phenomena are concerned.[70]

For conventional, marketed goods economics prescribes market-based methods for valuing goods and services (and losses to those goods and services). Market-based methods use prices and behavior directly observed in the real world to calculate benefits lost or gained. The key to these conventional methods, and their relative simplicity, is that conventional goods and

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[68] There is also a long history of integrated economic and biological production function analysis in agricultural and natural resource economics. Among other things, agricultural studies show how substitution of one farm input for another (e.g. land for fertilizer, tractors for man-hours) affects production levels, or how landscape characteristics affect yields. For a general overview, see John Penson, et al., eds., *Introduction to Agricultural Economics* (Upper Saddle River, NJ: Prentice Hall, 1999).

[69] Another way to make the point is to consider functionally identical ecosystems. Functional equivalence does not imply equivalent social value. Wetlands with an equivalent ability to remove nitrates from groundwater or absorb floodwater pulses will nevertheless differ in their social value. This follows since the number of people whose drinking water is purified and the number of homes protected from flooding will not be identical.

[70] See David Tilman and Peter Kareiva, *Spatial Ecology: The Role of Space in Population Dynamics and Interspecific Interactions* (Princeton, NJ: Princeton University Press, 1997).

services are privately owned and traded in functioning markets. Accordingly, prices and demand for such products are a good guide to the products' social value. As described earlier, however, natural resources held in public trust are not owned, nor are they traded in markets. Accordingly, there are no direct price signals of social value. Therein lies the problem for economic assessment. Instead, practitioners must employ relatively unconventional "non-market" valuation techniques.

Non-market valuation approaches fall into three broad categories: revealed preference, expressed preference, and derived willingness to pay.[71] Revealed preference studies look at the price people pay for marketed goods that have an environmental component. From those prices, inferences about the environmental benefits associated with the good can be made. One example is the value of habitat to commercial fishing. Another example is when people purchase a home near an aesthetically pleasing habitat with available access for recreation, home prices reflect the value of the aesthetic and recreation services realized by the homeowners.[72] Alternatively, for people who do not live near the site, recreational and aesthetic services can be valued by the time and money spent traveling to the area. These direct travel cost expenditures and imputed costs of travel time reveal a willingness to pay for the recreational services.[73] Differences in quality attributes can be valued if there are perceptible differences in the number, length, or cost of trips taken to sites of different quality.[74] The quality change may be from an alteration to the site. Consider another example. Sediment, nutrient, or pathogen trapping that affects swimming beach quality at a remote location can be valued if the relationship between the habitat of the remote site and the recreational quality of the beach can be estimated.

An expressed willingness-to-pay study asks people, in a highly structured way, what they would be willing to pay for a set of environmental improvements. Contingent valuation studies

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[71] For a good overview of these methods see A. Myrick Freeman, *Measurement of Environmental and Resource Values: Theory and Methods* (Washington, DC: Resources for the Future, 1993).

[72] Hedonic analysis is used in this type of study. See, e.g., Brent Mahan, Stephen Polasky, and Richard Adams, "Valuing Urban Wetlands: A Property Price Approach," 76 *Land Econ.* 100 (2000).

[73] There is a substantial literature on this subject. See, e.g., Kenneth McConnell, "On-Site Time in the Demand for Recreation," 74 *Amer. J. Agr. Econ.* 918 (1992).

[74] An important issue in travel cost studies, for example, is the definition of relevant substitutes for the sites in question. Northeast-Midwest Institute and National Oceanic and Atmospheric Administration, Revealing the Economic Value of the Great Lakes, 2001 ("omitting the prices and qualities of relevant substitutes will bias the resource valuations"), at 73.

and contingent ranking are examples.[75] Surveys of expressed willingness-to-pay are expensive and controversial, and answers to questions may be affected by the specific context. The more complex the habitat change and its consequences, the more difficult is the challenge of survey design and interpretation. A principal drawback to this approach is the risk that people may misunderstand the precise service being valued when undisciplined by the need to spend their own money. Also, respondents may not have fully formed preferences for the service. For both of these reasons, they may misstate their willingness to pay.[76]

In a valuation survey, the questions are structured in such a way that a particular economic calculation can be extracted from the results—willingness to pay in terms of a hypothetical amount of one's income for a change in the state of the environment. This calculation is expected to represent the nature of an individual's preferences and is a way to aggregate those preferences over individuals in a population.[77]

For many years, researchers have also derived benefits via simulation studies based on engineering analysis.[78] For instance, if we want to know the value of having a wetland reduce flood damages we can, in principle, estimate the dollar value of real property damage due to a flood event, and estimate the greater likelihood such an event will occur if the wetland is destroyed.

An important characteristic of benefit monetization studies is that they need not and typically do not monetize benefits arising from the entire suite of services generated by a site. This is true because different services typically require different assessment procedures. Recreational services will require one kind of study, eliciting existence values requires another approach, and understanding individual's valuation of flood prevention yet another. Contingent valuation surveys can be designed to value a wider suite of benefits, but this complicates the administration and design of the survey. In many situations, it is not feasible to implement a

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[75] See Richard Carson, Nicholas Flores, and Norman Meade, "Contingent Valuation: Controversies and Evidence," 19 *Environmental and Resource Economics* (2001), pp. 173–210, for a review and defense of contingent valuation's role in the evaluation of environmental goods and services.

[76] See, generally, Raymond J. Kopp et al. eds., *Determining the Value of Non-Marketed Goods* (Boston: Kluwer, 1997), which presents a good collection of articles relating to the contingent valuation method.

[77] If a measure of public opinion is desired to support decision making, other public opinion polling approaches and calculations also might be considered. For example a survey that asked about levels of agreement with statements about options and tradeoffs may be seen as a kind of "valuation" effort.

[78] Orris Herfindahl and Allen Kneese, Economic Theory of Natural Resources, Charles Merrill, Columbus 1974.

survey to determine the value associated with each parcel of habitat of open space, preservation of an acre of wetland habitat, or increase in catch per unit of effort for a recreational fishery. Therefore, economists have long argued for the use of benefit transfer methods as way to avoid site-specific monetization exercises and minimize the need for costly new data collection.[79] Benefit transfer methods essentially take the benefits estimated at a well-studied reference site and relate those benefits to the benefits likely to be found at a site of interest for preservation, mitigation, or exchange. The "transfer" of the benefits is made a function of differences in the reference site and site of interest. Benefit transfer still requires data collection and careful econometric analysis, but it reduces somewhat the burden of new data collection.

3.3 The Politics of NRD

The previous section describes the scientific and technical challenge of non-market benefit estimation. Although mainstream economics now accepts the validity of nonuse values at a conceptual level, the methods used to calculate those values remain controversial.[80] In particular, the science behind both the ecology and economics of this kind of assessment has been the subject of much debate.

Fear of NRD liability has prompted a set of legislative reform proposals, associated primarily with the reauthorization of CERCLA. Although no reforms have been enacted and the possibility of reforms remains in doubt politically, the reauthorization debate provides evidence of the concerns being raised by the private sector regarding financial responsibility for natural resource damages. Criticisms highlight the discomfort with which the regulated community approaches the valuation of NRD claims. The law's requirement that the public be "made whole"

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[79] For an overview of benefit transfer methodologies, see the special issue of *Water Resources Research* devoted to it, vol. 28, 1992. Also see S. Kirchhoff, B. Colby, and T. LaFrance, "Evaluating the Performance of Benefit Transfer: An Empirical Inquiry," *Journal of Environmental Economics and Management* 35, (1997), pp. 75–93, and Raymond Kopp and V. Kerry Smith, *Valuing Natural Assets: The Economics of Natural Resource Damage Assessment* (Washington, DC: Resources for the Future, 1995), p. 329.

[80] Northeast-Midwest Institute and National Oceanic and Atmospheric Administration, "Revealing the Economic Value of the Great Lakes," 2001, ("The development of natural resource damage assessment regulations was controversial because stakeholders disagreed over what damages would be assessed, how damages would be calculated, and how damages to environmental goods and services not valued in traditional markets would be calculated"), at 22.

following a natural resource injury, combined with the inherent difficulties of natural resource valuation, have been a source of political controversy and calls for reform.[81]

A common feature of reform bills is the restriction or elimination of recovery for lost nonuse values.[82] Some reform packages prohibit the use of the CV method to value NRDs.[83] Note, however, that none of these reform bills has passed, and there has been significant opposition to weakened NRD provisions, including opposition from the Clinton administration and from other administrative agencies.[84] Some states limit the methodologies that can be used by states to calculate the scale of NRDs. An example is Michigan's prohibition against use of the CV method to determine damages.[85] It should also be noted that the most controversial valuation methods, such as CV, have in actuality been employed infrequently.[86]

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[81] Consider the following representative comment in the U.S. legislature: "The liabilities imposed on vessel owners under OPA are subject to dramatic inflation because of the methodologies embraced by agencies of the United States in calculating natural resource damages." Testimony of Svein Ringbakken, International Association of Independent Tanker Owners, Hearing before the Subcommittee on Coast Guard and Maritime Transportation of the Committee on Transportation and Infrastructure, House of Representatives, June 26, 1996.

[82] See S.8, Part 403, 105th Cong., A Bill to Reauthorize and Amend the Comprehensive Environmental Response, Liability, and Compensation Act of 1980, introduced January 21, 1997 (there will be "no recovery under this Act for any impairment of nonuse values"), and S.1537, 106th Cong., Superfund Amendments and Reauthorization Act of 1999, introduced in the Senate August 5, 1999.

[83] See S.8, note 82 *supra*, which states that a trustee's claim for recoverable assessment costs "may not include the costs of conducting any type of study relying on the contingent valuation methodology."

[84] See National Association of Attorneys General, Resolution, Superfund Reauthorization, Adopted June 22–26, 1997, available at http://www.senate.gov/~epw/105th/joh_9-04.htm (accessed August 19, 2004) Also, see Charles Openchowski, Superfund in the 106th Congress, 30 ELR 10648, 10659.

[85] Michigan law establishes liability for natural resource injury (Act 451, MCL 324.20126a). However, contingent valuation methods cannot be used for damage calculations "unless a determination is made by the department that such a method satisfies principles of scientific and economic validity and reliability and rules for utilizing a contingent nonuse valuation methods or a similar nonuse valuation methods are subsequently promulgated." MCL 324.20104(3).

The state of Texas lists a set of acceptable valuation methods. The list includes contingent valuation but requires that contingent valuation studies be undertaken only in accordance with guidelines established by NOAA. 31 TAC § 20.32(f).

[86] See testimony of Douglas Hall, NOAA, Subcommittee on Water Resources and Environment, House of Representatives, July 11, 1995. "There have only been six contingent valuation studies completed to date, and only one in which the Federal Government was involved in litigation."

3.4 Damages: Lost Benefits Versus Replacement Cost

Most NRD cases demand significant amounts of data regarding both biophysical conditions and demand for the services damaged. The cases tend to be complex and have not always been successful.[87] Whatever the precise approach, non-market benefit studies are complex, time-consuming, and costly. Methods seeking monetary estimates of ecosystem benefits are technically challenging, fraught with dangers that may not be obvious to non-practitioners, and require significant amounts of data collection. In other words, economic valuation methods are expensive and difficult to execute, particularly by non-economists. professionally credible study costs, at a minimum, hundreds of thousands of dollars and can easily cost orders of magnitude more.[88]

It should not come as a surprise that NRD assessments have shifted from an emphasis on monetary benefit estimation to non-monetary techniques—in particular, habitat equivalency analysis.[89] This is understandable given the practical difficulty of ecological benefit studies. It is important to note, however, that in principled economic terms replacement cost is not the preferred method for damage assessment. The reason is that the costs of replacing a lost biophysical function may exceed the social benefit of the function. In effect, replacement cost damages can lead to wasteful expenditure on relatively unimportant resource improvements.

Consider a more conventional example to make the point. If a window is broken in an abandoned building we would not necessarily require its breaker to replace the window, since the building may be unused or near demolition. Replacing the window would in such a situation be wasteful. This same argument can hold in some cases of damage to natural assets. The alternative—explicit benefit estimation—as argued above can be costly and difficult. Also, the underlying uncertainties associated with biological systems make it difficult to say a particular biophysical function is as unimportant as a broken window in an abandoned building. The protection against particularly inefficient outcomes is the "grossly disproportionate" standard,

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[87] For an excellent description of the NRD process in court see David Chapman and W. Michael Hanemann, "Environmental Damages in Court: the American Trader Case," in Anthony Heyes, ed., *The Law and Economics of the Environment* (Cheltenham, UK, Elgar, 2001).

[88] See Bill Conner and Ron Gouget, "Getting to Restoration," *The Environmental Forum* (2004), pp. 19–29. In the case of the Exxon Valdez, government studies alone cost more than $100 million.

[89] See Carol A. Jones and Katherine A. Pease, "Restoration-Based Measures in Natural Resources Liability Statutes," *Contemporary Economic Policy*, XV (October 1997); also see Monica P Medina, "Just Do It," *The Environmental Forum* (July/August 2001).

whereby benefit-based damages can be required only in cases where restoration is infeasible or where restoration costs are "grossly disproportionate."[90]

The NOAA assessment rules favor restoration over monetary measures largely because restoration costs are easier to estimate.[91] Similarly, DOI is contemplating revisions to its NRD assessment rule, including a reduced role for methodologies that economically quantify damages, in favor of resource-based measures.[92] A restoration cost estimate relies on easily computable capital and labor costs (e.g., the costs of dredging, species reintroduction, or contaminant neutralization). These costs are easier to predict, rely on fewer economic valuation methodologies, and are verifiable *ex post*.[93] According to a NOAA director,

> Earlier damage assessment procedures emphasized determining a monetary value for the loss of use of the injured resources. Criticisms of this approach led NOAA to … develop regulations that focus on damages measured by the actual cost of restoration…. Focusing on determining the appropriate scale of restoration projects is preferable to focusing on the monetary amount of damages…. Instead of collecting damages, then determining how to spend that money on restoration, the goal of assessment is now focused on timely, cost-effective restoration of the natural resources that have been injured.[94]

In general, there remains a pronounced desire to avoid monetization of losses and gains. Monetization is not prohibited but is rarely favored.[95]

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[90] See note 53 *supra*.

[91] For a discussion of damage assessment challenges, see Rebecca Renner, "Calculating the Cost of Natural Resource Damage," *Environmental Science and Technology* 32:3 (1998), p. 86.

[92] Interior Department Revises NRDA Rule to Lessen Focus on Economic Impact, *Environmental Policy Alert,* (September 6, 2000), pp. 7–8.

[93] The private sector prefers restoration cost to monetization, largely because of the former's greater predictability. See Guide to P&I Cover, *The Standard* (http://www.standard-club.com/frameset.asp, accessed September 16, 2004) responding to the NOAA rules: "The final rules are clearly much better than the initial draft rules because they concentrate on restoration. However, the rules still create the very real likelihood that trustees will produce large and speculative claims in the United States in respect of damages to natural resources."

[94] Testimony of David M. Kennedy, Office of Response and Restoration, NOAA, before a joint House Hearing, Subcommittees on Coast Guard and Maritime Transportation and Water Resources and Environment, March 24, 1999, http://www.house.gov/transportation/cgmt/03-24-99/03-24-99memo.htm (accessed August, 18, 2004).

[95] See note 48. Also, 15 CFR 990.53(d)(3)(ii). "If valuation of the replacement natural resources and/or services cannot be performed within a reasonable timeframe or at a reasonable cost…trustees may estimate the dollar value of the lost services and select the scale of the restoration action that has a cost equivalent to the lost value."

How do replacement cost damages get assessed in practice? The easy part of this damage calculation is the cost of restoration to the damaged resource itself. The capital, labor, and other costs necessary to the restoration are the cost of replacement and form the basis of damages. There is a more difficult aspect of the damage calculation, however. This challenge arises because it is necessary to compensate for losses arising in the period between an incident and full restoration—a period that can span decades.[96]

These are called "interim losses" and, by definition, cannot be achieved via on-site restoration. Accordingly, interim losses require a search for comparable restoration actions. This requires a comparison of natural resource services provided by different types of natural or constructed assets and across different sites. Numerous challenges are associated with this kind of comparison. A first step is the identification of comparable restoration alternatives. Comparable alternatives mean restoration actions that provide the same type of resources or that provide the same kind of services as the injured resources. Once comparable actions have been identified, the government must then determine "the scale of those actions that will make the environment and public whole."[97] Scaling often relies on the concept of ecosystem services.[98] If a resource's services are identified and the scale of those services estimated, the same can be done for a second, comparable resource. Protection, restoration, or enhancement of the second resource can then be defended as a comparable action. The NOAA rules, for instance, refer to both "resource to resource" and "service to service" valuation methods.[99] One particular

[96] There are two reasons that off-site restoration is typically needed to achieve full social compensation. First, complete physical restoration of the injured resource may be impractical. For instance, complete restoration of a damaged site is often cost prohibitive. If so, some other form of compensating restoration will be pursued, usually involving the enhancement of another comparable, but not identical, resource. Second, interim natural resource service losses must be compensated. Restoration of a site to prerelease conditions does not compensate for these interim losses. Supplemental restoration actions, either on site or off site, must be undertaken to compensate for those types of losses.

[97] 15 CFR 990.53(d). For the CERCLA rules, see 43 CFR 11.80. "Damages may also include, at the discretion of the authorized official, the compensable value of all or a portion of the services lost to the public for the time period from the discharge or release until the attainment of the restoration, rehabilitation, replacement, and/or acquisition of equivalent of the resources and their services to baseline."

[98] 43 CFR 11.71. "Services include provision of habitat, food and other needs of biological resources, recreation, other products or services used by humans, flood control, ground water recharge, waste assimilation, and other such functions that may be provided by natural resources." 43 CFR 11.70. "Upon completing the Injury Determination phase, the authorized official shall quantify for each resource determined to be injured and for which damages will be sought, the effect of the discharge or release in terms of the reduction from the baseline condition in the quantity and quality of services provided by the injured resource.…"

[99] 15 CFR 990.53(d)(2).

replacement cost method is called Habitat Equivalency Analysis, which scales restoration to compensate for interim losses.[100] The method involves adding up and discounting the stream of lost benefits and comparing that to the level of services created by a restoration project.[101]

Habitat equivalency analysis and other replacement cost methods are used to avoid the challenges of monetary, benefit-based damage calculations. They are a pragmatic alternative, though not without their own challenges. What should not be missed is the importance of the U.S. government's ability as a trustee to collect damages for injury to public natural resources, irrespective of the method used to calculate the damage. Other countries can learn from the U.S. experience in tackling the difficult issues raised by resource value methods. But the more important message is that natural resource damages are real in economic terms. Governments concerned with deterring and compensating for these real losses can look to the U.S. NRD experience as a successful first step.

4. NRD Claims—Scale and Frequency

The widespread application of NRD claims is relatively recent.[102] For this reason, and because there is no central repository of data on NRD claims, it is difficult to accurately summarize the range of NRD awards collected in the United States. By far the largest NRD case was the Exxon *Valdez* recovery. The *Valdez* case involved $2.1 billion in cleanup costs, approximately $1 billion in natural resource damages,[103] and a $5 billion punitive damage award.[104] Although a

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[100] See "Habitat Equivalency Analysis: An Overview, Damage Assessment and Restoration Program," NOAA, 2000 ("The public can be compensated for past losses of habitat resources through habitat replacement projects providing additional resources of the same type," p. 1).

[101] Id., at 3 ("The process of scaling a project involves adjusting the size of a restoration action to ensure that the present discounted value of project gains equals the present discounted value of interim losses"). For a concrete example, see David Chapman, Nicholas Iadanza, and Tony Penn, "Calculating Resource Compensation: An Application of the Service-to-Service Approach to the Blackbird Mine Hazardous Waste Site," Damage Assessment and Restoration Program, NOAA Technical Paper 97-1, October 16, 1998.

[102] The first NRD case filed under CERCLA (New Bedford) was in 1987. Also, see Duane Woodward and Michael Hope, "Natural Resource Damage under the Comprehensive Environmental Response, Compensation, and Liability Act, 14 *Harvard Environmental Law Review* 189 (1990), citing lack of NRD cases as of 1990.

[103] 4 Oil Spill U.S. Law Rep., November 1994, at 13–14.

[104] The punitive damages have been appealed several times and have not been collected. In re *Exxon Valdez,* no. A89-095-CV (HRH) (D. Ct. Alaska, September 24, 1996).

particularly visible case, *Valdez* was unique in the scale of injury caused, damages awarded, and methodologies used, including extensive use of the CV methodology.[105]

The government's pursuit of NRDs continues to evolve as it gains legal and economic experience with this kind of case. Meanwhile, several government and research studies provide at least a rough guide to the scale and likelihood of NRD claims. Two U.S. General Accounting Office (GAO) reports have addressed the scale of NRD claims under CERCLA, looking at numbers that reflect NRDs collected both inland and in the coastal zone. The first report found that as of April 1995, federal trustees had come to monetary NRD settlements in 50 cases[106] for a total of $106 million, with recoveries ranging from $4,000 to $24 million.[107] As of that time, the five largest NRD settlements (not necessarily recoveries) ranged from $12 million to $24 million.[108] Another 50 cases had settled with no NRD-specific payments, usually because site remediation activities were judged to have sufficiently addressed natural resource damages. The numbers were updated in a second report later in 1996.[109] As of July 1996, total NRD settlement amounts had increased to $109 million from cases at 62 sites.[110]

More up to date numbers are available for NRD recoveries involving NOAA's Damage Assessment and Restoration Program. These numbers reflect coastal NRD recoveries brought under OPA, CERCLA, NMSA, or the CWA. They do not reflect "inland" NRD recoveries.[111] Between 1991 and 2002 total NRD awards total $290 million from 56 cases. The average NRD recovery for these coastal cases is $4 million per case. The average NRD costs of oil-spill related damages are lower than for hazardous waste related damages. For cases authorized under

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[105] See Richard T. Carson et al., A Contingent Valuation Study of Lost Passive Use Values Resulting from the *Exxon Valdez* Oil Spill (Report to the Attorney General of Alaska), November 10, 1992.

[106] At that time there were 1,290 sites on the National Priorities List.

[107] U.S. General Accounting Office, *Outlook for and Experience with Natural Resource Damage Settlements*, GAO/RCED-96-7l, April 1996, pp. 4–5.

[108] As of July 1995, only about 40% of the $83.8 million had been collected.

[109] U.S. General Accounting Office, *Superfund: Status of Selected Federal Natural Resource Damage Settlements*, GAO/RCED-97-10, November 1996.

[110] Ibid. As of July 1996, about 80% of the settlements had been collected.

[111] These data are based on NOAA, Damage Assessment and Restoration Program, Natural Resource Damage Settlements and Judgments, 2002. The numbers reported here are based on statistics that exclude two inland cases (Blackbird Mine and Iron Mountain Mine) from the NOAA data.

CERCLA the average NRD award is $7 million, while for cases authorized under the OPA the figure is $3.2 million.[112] There is no clear time trend in the scale of NRD claims.

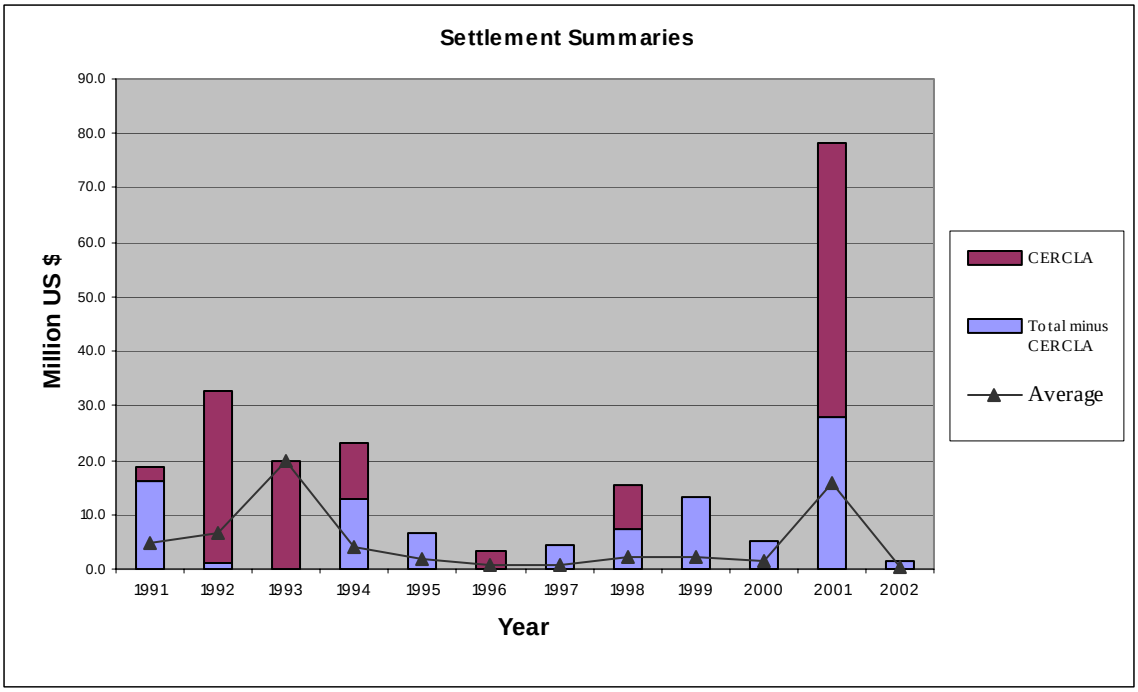

FIGURE 1: Settlements by Year, in Millions of Dollars. Source: *NOAA, Damage Assessment and Restoration Program*

Figure 1 shows total "coastal" NRD claims, by year.[113] The CERCLA claims roughly correspond to damages caused by non-oil hazardous substances. The remainder are predominately oil-related damages.

In one sense NRD costs are a relatively small fraction of total oil spill liability. This is due to the fact that NRD claims are brought in only 10 percent of the coastal oil spills reported

[112] As noted earlier, cases can also be brought under the CWA and the NMSA.

[113] See note 111.

each year.[114] NRD costs can be a large percentage of a particular case, however. A study of spills between 1984 and 1997 found that NRD damages—when they are claimed —account for 26% of the total damages, which include response costs, third-party claims, and government penalties.[115]

The significance of NRD liabilities remains a subject of debate. In the eyes of NRD reform advocates (typically representing the regulated community), future NRD liabilities pose a huge potential cost.[116] In the eyes of government trustees, NRD claims represent a small and manageable fraction of the environmental costs generated by polluting vessels and facilities.[117]

5. Financial Assurance's Role in Compensation and Deterrence

In combination with liability law, financial responsibility rules foster the internalization of social costs by polluters by ensuring that firms possess the resources needed to compensate society for environmental costs. Insolvency can truncate the penalties borne by strictly liable tort

[114] See Conner and Gouget, note 88. This percentage is in part a reflection of the significant costs associated with damage assessment and the pursuit of NRD claims. See U.S. General Accounting Office, *Outlook for and Experience with Natural Resource Damage Settlements*, GAO/RCED-96-7l, April 1996, at 4. "Department of Justice officials state that the level of appropriations to fund federal natural resource damage programs is the single most important factor in determining how many sites can be assessed for damages."

[115] Douglas Helton and Tony Penn, Putting Response and Natural Resource Damage Costs in Perspective, mimeo, paper ID #114 1999 International Oil Spill Conference, http://www.darp.noaa.gov/library/pdf/costsofs.pdf (accessed August 18, 2004). The study looked at 48 oil spill incidents occurring between 1984 and 1997.

[116] See statement of George Mannina, Director, Coalition for NRD Reform, Committee on Environment and Public Works, U.S. Senate, September 4, 1997. "When the NRD coalition formed two years ago, we were told NRD was a small problem involving only a few sites. A scant two years later, federal trustees state that they want to use their NRD authority at half the NPL sites and at 80,000 surface lagoons, 14% of all U.S. lake acreage and 4% of all U.S. river miles."

[117] See testimony of Douglas Hall, NOAA, 1995 House Hearing, note 86 *supra.* "With regards to the claim that NRD is a sleeping giant that is going to bankrupt industry, this is simply not the case. It amounts to nothing more than speculation that is unsupported by the record. We have had less than 5% of the sites on the national priorities list that have required compensation for natural resource injuries in addition to remediation. The compensation for natural resource damage at all NPL remedial sites has been less than 1% of the cost of remediation."

defendants and thereby reintroduce the possibility of externalized social costs.[118] Any such externalization means that potential defendants will not be sufficiently motivated to take precautions against risk.[119] Bankruptcy and corporate dissolution defeat the law's ability to force polluter cost internalization by allowing many firms to abandon environmental responsibilities after reaping short-term financial gains. Nonrecoverable environmental obligations are more than a theoretical possibility. The U.S. landscape is littered with environmentally damaging operations that were either abandoned entirely or left unreclaimed due to bankruptcy.[120]

Two financial assurance rules govern marine oil and hazardous waste operations. The first rule, authorized by both OPA and CERCLA, governs water-borne vessels that carry oil or hazardous substances.[121] The second rule, authorized by OPA, governs offshore facilities used for oil exploration, drilling, production, or transport.[122] The vessel and offshore facility financial responsibility rules describe, among other things, implementation schedules, types of facilities to which the rules apply, financial instruments with which compliance can be achieved, minimum coverage amounts, and enforcement procedures. Individual coastal states may also impose

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[118] Bankruptcy proceedings do not always limit the ability to recover costs, though they certainly do not foster cost recovery. Generally speaking, debtors are protected from creditors (which can include tort victims) by the "automatic stay" provision of the U.S. bankruptcy code, 11 USC § 362(a). There is, however, a "police and regulatory power exception" to the automatic stay. The exception states that the automatic stay does not apply to the "commencement or continuation of an action or proceeding by a governmental unit to enforce such governmental unit's police or regulatory power," 11 USC § 362(b)(4). Courts have generally held that a CERCLA action is an exercise of the government's police or regulatory power and is not subject to the automatic stay. See generally, Richard L. Epling, "Impact of Environmental Law on Bankruptcy Cases," 26 *Wake Forest Law Review*, 69 (1991).

[119] For analyses that have explored or employ this reasoning, see motivation to take precaution against risk. For analyses that explore or employ this reasoning, see Alan Schwartz, Products Liability, Corporate Structure, and Bankruptcy: Toxic Substances and the Remote-Risk Relationship, 14 J. Legal Stud. 689, 1985; Steven Shavell, The Judgment-Proof Problem, 6 Int'l Rev. L. & Econ., 45, 1986; William Landes and Richard Posner, The Economic Structure of Tort Law, 1987; Lewis Kornhauser and Richard Revesz, Apportioning Damages Among Potentially Insolvent Actors, 19 J. Legal Stud. 617, 1990; and James Boyd and Daniel Ingberman, Noncompensatory Damages and Potential Insolvency, 23 J. Legal Stud. 895, 1994.

Note that the mere possibility of bankruptcy is sufficient to weaken liability's ability to deter. The corollary to this statement is that bankruptcy need not already be observed for it to have an effect on firm incentives. From the standpoint of *ex ante* decision making, whenever bankruptcy occurs with a positive probability the incentive to make costly investments in risk reduction is reduced.

[120] See James Boyd, "Financial Responsibility for Environmental Obligations: Are Bonding and Assurance Rules Fulfilling Their Promise?" 20 *Research in Law and Economics* (2002) (also available at http://www.rff.org/Documents/RFF-DP-01-42.pdf).

[121] 33 USC §2702; 42 U.S.C. §9607(a)(1). The vessel financial responsibility rules are codified at 33 CFR part 138.

[122] OPA §1016. The offshore facility financial responsibility rules are codified at 30 CFR part 253.

financial responsibility requirements on vessels using their waters. For example, in 2004 Massachusetts passed a law requiring up to $1 billion in coverage for certain vessel operators.[123]

The vessel rule applies to tank vessels of any size, foreign-flag vessels of any size, and mobile offshore oil and gas drilling units.[124] Some smaller commercial vessels, such as barges not carrying oil or hazardous substances, are excluded from the regulations. The offshore facility rule applies to facilities "in, on, or under" navigable waters. Covered facilities include platforms, terminals, refineries, and pipelines used for oil exploration, drilling, and production.[125]

Vessel liability limits are a function of the vessel's size and type of cargo (oil vs. hazardous substances).[126] For large vessels, the limit (and coverage requirement) is $1,200 per gross ton for oil cargo and $600 per gross ton for hazardous substance cargo. Offshore facility liability limits are based on calculations of the volume of a "worst-case" oil spill discharge. There are four types of "allowable mechanism" that can be used by firms to demonstrate the existence of coverage: insurance, surety bond, self-insurance, and financial guaranty.[127] All four mechanisms are designed to ensure that liabilities can be satisfied, up to the statutory coverage requirements.

Insurance and surety bonds are financial commitments, purchased from third parties, guaranteeing payment of claims arising from liabilities of the purchaser. Generally speaking, insurance contracts "pay out" when a liability claim arises. Surety bonds are somewhat different in that the risk of loss remains with the principal (rather than being transferred to an insurer). The surety pays out only when the principal defaults.[128] In most other respects, however, these two instruments are substantially similar. Not all insurers and sureties are acceptable coverage

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[123] State of Massachusetts, Chapter 251 of the Acts of 2004: An Act Relative to Oil Spill Prevention and Response in Buzzards Bay and Other Harbors and Bays of the Commonwealth.

[124] 33 CFR 138.12.

[125] 30 CFR 253.3.

[126] See 33 CFR §138.80(f)(3)

[127] The mechanisms are described at 33 CFR 138.80 (for vessels) and 30 CFR 253.28-31 (for offshore facilities).

[128] *Schmitt* v. *Insurance Co. of North America* (1991) 230 Cal.App.3d 245, 257. Typically, though, either the principal or surety may be sued on a bond, and the entire liability may be collected from either the principal or the surety. This characteristic of surety bonds is also tempered by the FR rules' "direct action" requirements, described below.

providers. In the case of surety companies, they must be one of those certified by the U.S. Treasury Department.[129]

Self insurance allows relatively deep-pocketed companies to satisfy the coverage requirement by demonstrating sufficient financial strength. The vessel rule requires that two measures of financial strength, "working capital" and "net worth," both be greater than the coverage requirement. The tests require not only financial strength, but also financial strength based on domestic assets, in order to foster cost recovery. When using the financial test, firms must make annual reports that are independently audited according to generally accepted accounting practices.

A financial guaranty, or indemnity, agreement allows another firm, such as a parent corporation, to satisfy the coverage requirement. Financial guarantors must themselves pass the corporate financial test and agree to guarantee the liabilities of the potentially liable firm. The requirements are identical to those for self-insurers, including the domestic assets requirement.

An important policy question is whether financial assurance for environmental liabilities should be made mandatory. An alternative, of course, is to rely on the voluntary provision of environmental coverages by private markets. Clearly, if left to themselves, private markets will demand and supply environmental insurance coverage. We know this, because we can observe such markets in active operation. The question, of course, is whether markets will voluntarily provide adequate insurance coverage from the standpoint of public policy. When purchased voluntarily, insurance benefits the purchaser by reducing risk, which is valuable in the presence of risk aversion. Note, however, that insurance is not voluntarily purchased as a means to internalize costs. In fact, cost internalization is directly at odds with the profit motive. When a firm expects to externalize some fraction of large liability claims against it (the judgment-proof problem), the desire for insurance in response to risk aversion will be countered by the desire to avoid internalizing otherwise externalized costs.

Why does insurance imply greater cost-internalization by an insured? In the United States any insurer providing coverage to a potentially judgment-proof customer must build into the insurance cost its own exposure to the insured's liabilities. Insurers have been exposed to such costs under U.S. law. Demand for environmental insurance thus usually involves this tradeoff: risk-spreading versus greater cost internalization. When a firm's potential liabilities exceed its

[129] 30 CFR 253.31; 33 CFR 138.80(b)(2).

capital value, the disincentive to purchase insurance (greater cost internalization) is likely to outweigh the benefits of insurance (reduced uncertainty).

Finally, political opposition to mandatory financial responsibility serves as a confirmation that insurance is unlikely to be provided voluntarily. While some opposition is due to complaints regarding arguable imperfections in the mandatory mechanisms themselves (e.g., the P&I Clubs' opposition to the lack of policy defenses), many of the complaints are due simply to the obvious costs of compliance.[130] These costs, of course, are exactly what will inhibit the spontaneous voluntary development of an adequate cost-internalizing environmental insurance market. However, private sector coverage mechanisms are available, and at rates that can be absorbed by most of the firms to which the requirements apply. Moreover, the trends in coverage availability and premium affordability are positive.[131]

Even with OPA and CERCLA's financial responsibility provisions a significant fraction of spill damages go uncollected due to bankruptcy or dissolution. One illustrative statistic is that between 1990 and 2002 more than 17% of payments from the Oil Spill Liability Trust Fund were unrecoverable due to bankruptcy or dissolution.[132]

6. Conclusion

Two distinctive features of the Oil Pollution Act and related aspects of CERCLA are worthy of international emulation. The first is the creation of liability for natural resource damages. For both economic and environmental reasons, NRD liability is an important

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[130] A focus of lobbying efforts in the United States is for the relaxation of the conditions under which firms can self-insure (i.e., not have to purchase insurance from third parties). It is clearly in a firm's economic self-interest to qualify. According to one committee reviewing such proposals "additional mechanisms for qualifying as a self-insurer are needed to ensure that the costs of demonstrating OSFR do not cause serious economic harm to responsible parties." Minerals Management Service, OCS Policy Committee Passes Recommendations on Oil Pollution Act Financial Responsibility Requirements (#50033), May 4, 1995 (viewed at http://www.mms.gov/ooc/press/1995/50035.txt). The public policy implications of relaxed qualifying conditions are negative, since relaxed conditions thwart cost internalization. The unsurpising message to be taken from such a statement, however, is that greater cost internalization is costly. It is something firms wish to avoid, rather than something they will pursue voluntarily.

[131] See James Boyd, "Financial Responsibility for Environmental Obligations: Are Bonding and Assurance Rules Fulfilling Their Promise?" 20 *Research in Law and Economics* (2002).

[132] The trust fund is a public revenue fund used to finance responses to spills. The fund then seeks collection of response and other costs from the responsible party. National Pollution Funds Center, Year in Review FY2001-02, p. 10.

component of statutes designed to deter environmentally damaging behavior and provide compensation necessary to restore injured resources. Society in the broadest sense derives significant benefits from ecological assets in their natural state. While difficult to estimate with precision, these social benefits should be included in a regulatory calculus that seeks to internalize costs and make the polluter pay. NRDs are the principal mechanism to foster internalization of costs imposed on collective, public environmental resources.

The second distinctive feature of compensation law is the inclusion of mandatory asset and insurance requirements, or financial responsibility rules. These rules address a practical problem associated with the use of liability: the possibility that a defendant will dissolve or lack the wealth necessary to pay its liabilities after an accident. Financial responsibility rules are thus an important compliment to liability law. Particularly because marine accidents can create in an instant multi-million dollar liabilities, regulations should be in place to ensure that such liabilities will in fact be internalized by a polluter.

While significant implementation issues must be confronted, particularly as regards the calculation of natural resource damages, NRD liability and financial responsibility rules foster an environmentally sound and economically efficient approach to the regulation of marine and coastal spills.