THE ROLE OF ECOSYSTEM SERVICES IN NATURAL RESOURCE LIABILITY LITIGATION IN THE US

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Major US natural resource liability laws

**Oil spills**
- Oil Pollution Act, Clean Water Act

**Hazardous waste**
- Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)

**Protected resources**
- National Marine Sanctuaries Act, Park System Resource Protection Act, Applicable State Laws
Features of US natural resource liability statutes

- Establish liability for environmental harm to public resources
- Embody the principle that the “polluter pays” damages sufficient to “make the public whole”
- All recoveries are to be spent on restoration or replacement of resources
- Designate Federal, state, and tribal resource agencies as trustees to bring suits on behalf of public (not citizens)
- Citizens can file private claims for financial losses
Claims for public natural resource damages (NRD) are one of many potential types of claims in a case.

*Deepwater Horizon 2010 oil spill BP payouts (2015):*

- NRD: $8.1 billion + up to $0.7 billion for unknown injury and adaptive management
- Response and clean up costs (self-implemented and self-reported): $14 billion
- Civil penalties: $5.5 billion
- Criminal settlement: $4 billion
- Financial losses of private individuals, state and local governments: $19.3B
US measure of damages in NRD liability

Goal: Make public whole for resource injuries

1. Cost of restoring (or replacing) injured resources and services to baseline level (but-for injury)
2. Compensation for interim losses from time of injury until resources recovery to baseline
3. Reasonable costs of assessment

Statutory Restriction: all recoveries must be spent on restoring or replacing resources
Full compensation: restoring resources to baseline *plus* compensation for interim losses

Ecosystem Services

Interim Losses with Restoration

Baseline Service Level

Incident  Primary Restoration Begins  Full Natural Recovery

PD Value = Present discounted value
Metric is ecosystem services

Provisioning Services (may be sold on market)
- Products from ecosystems
  - Food
  - Water
  - Raw materials
  - Medicinal resources
  - Ornamental resources
  - Genetic resources

Regulating Services (not sold on market)
- Climate regulation
- Natural hazards regulation
- Purification and detoxification of water, air and soil
- Water / water flow
- Erosion and soil fertility
- Pollination
- Pest and disease regulation

Cultural Services (not sold on market)
- Recreation and tourism
- Aesthetic values
- Information for education and research
- Spiritual and religious experience
- Cultural identity and heritage

Habitat Services (not sold on market)
- Maintenance of species lifecycles
- Biodiversity maintenance and protection
Ecosystem service losses from typical oil spill

- Spill oils recreational beaches and wetland habitat
- Ecosystem services losses:
  - Cultural: recreation
  - Habitat: nursery services, gene pool protection
  - Provisioning: timber, fishery, agriculture, water, hydro power
  - Regulating: carbon storage, flood and erosion prevention, pest control
Two approaches to damages claims

**Initial US version:**

1. Costs of *primary restoration* or replacement *plus*

2. *Value* of interim losses

**{New preferred US version:}**

1. Costs of *primary restoration* or replacement *plus*

2. Costs of *compensatory restoration* (compensating for interim losses)

=> A Restoration Plan
Valuation methods for non-market ecosystem services

• Infer value based on choices: observed or stated

• Revealed preference methods: travel cost
  – Opportunity cost of travel functions like a price: willingness to travel long distances signals high value
  – Used to value lost recreation

• Stated preference methods:
  – Individuals offered scenarios of goods or services, and supply context, including payment method
  – Asked if they would be willing to pay specified price
  – Only option to value market goods that are not currently available or non-market goods/ecosystem services with passive use value
Matching valuation methods to injured ecosystem services

Examples of methods suited to particular uses:

• **Commercial (market goods)**: Market models of supply and demand

• **Recreation**: Travel cost method

• **Indirect (off-site) human use impacts for ecological services**:  
  – Production functions (linking the service to the human use), plus values (from a valuation method) for the impact
  – Contingent valuation for values
The second approach to damages claims embodies multiple uses of term “restoration costs”

Initial US version:
1. Costs of **primary restoration** or replacement *plus*

2. **Value** of interim losses

Issues:
- Economic methods for non-market valuation can be controversial
- Not consistent with statutory requirement to spend recoveries on resources

New preferred US version:
1. Costs of **primary restoration** or replacement *plus*

2. ** Costs of compensatory restoration** (compensating for interim losses)

=> A Restoration Plan

Option remains to calculate interim lost **value** pending recovery as claim, and allocate to restoration
Role of ecosystem services in compensatory restoration

• Inform choice of compensatory restoration projects
  – Priority is for in-kind ES replacement: *not only of same type, but also of same quality and comparable value (capacity/opportunity/payoff)*
  – When not feasible, will a different set of resources provide comparable services and comparable value?

• Choice of metric to capture ES quantity and quality, for scaling compensatory restoration projects
Compensatory restoration:
Priority for in-kind projects of same quality/comparable value

- **Injured habitat**: rehabilitate degraded habitat, acquire and protect habitat threatened by development
- **Injured resources**: rehabilitate injured animals; enhance spawning, nesting or foraging habitat; manage predators; reestablish breeding colonies, reduce fishing by-catch
- **Lost recreational use**: improve quality of resource, increase access to resource (boat ramps, boardwalks over wetlands), increase environmental awareness (educational centers)
- **Native American cultural losses**: fund cultural institutions focused on horticulture, medicine, healing, language transmission; apprenticeships
Scaling compensatory restoration so that PD Value(gains = B) = PD Value(losses = A)

PD Value = Present discounted value
Approaches to scale compensatory restoration: 
*How much is enough?*

- Scaling: value created by compensatory restoration is comparable to lost value from injury

\[
PD \text{ Value (services lost until resource recovers)} = PD \text{ Value (services gained from project lifetime)}
\]

Where \(PD\text{ Value} = \text{present discounted value over time}\)

- Two approaches: *Service to service* (a simplified approach, analogous to environmental trading); *Value to value*

- Alternative: *value to cost*
Scaling: Service-to-service approach

• When:
  – Compensatory project resources & services are of same type and quality, and comparable value to injured resources

• What:
  – PD (service losses) = PD (service gains) ie, value cancels out of both sides of the equation
  – Claim = cost of implementing restoration

• Method: Habitat or resource equivalency analysis
  Most commonly used approach for US habitat or resource injuries
Habitat Equivalency Analysis: Applications and challenges

- Applications to date include seagrass, marsh, oyster reef, mangrove, coral, soft-bottom benthos, river/riparian habitats
- Resource Equivalency Analysis is a variant, where injury involves primarily one or more species, rather than habitat
- Choice of ES metric: (ratio of service levels at injury and project sites)
  - Typically ecological process or function – rely on choice of projects to ensure service levels occur in same proportion to the metric at injury and compensatory project sites
  - Scientific judgment is required to identify equivalencies when substitutions are made across landscape, time, habitat species
- Upheld in court in 2 early seagrass cases; most cases are settled
Scaling: Value-to-value approach

• **When:**
  – *Compensatory* project resources and services do not provide same type and quality of services, but provide comparable services (lower ranked option)

• **What:**
  – $PDV \text{ (service losses)} = PDV \text{ (service gains)}$
  – Claim = cost of implementing restoration

• **Methods:**
  – Stated preference methods
  – Travel cost models
  – Benefits transfer (apply value estimates from other studies)
  – Avoidance or replacement costs (lower bound)
Value-to-value: Applications and challenges

• Limited applications to date include:
  – Recreational fishing in Lavaca Bay (replacement in-kind ES)
  – Lower Fox River/Green Bay (replace different resource due to enduring, widespread PCD contamination of fishery resources)

• Usage limited due to:
  – More costly and controversial than simplified HEA approach
  – Constrained in number of tradeoff parameters that can be estimated to avoid respondent burden: makes it difficult get enough detail to inform restoration planning
Scaling: Value-to-cost option

• When:
  – Service-to-service not appropriate; and
  – Valuation of lost services is possible, but valuation of replacement services cannot be done at reasonable cost

• What:
  – Claim = PD value of interim losses (spend on restoration projects)

• Methods:
  – Stated preference methods (value total interim losses)
  – Benefits transfer (apply value estimates from other studies) to value individual lost services: create valuation schedules
Value-to-cost: Applications and challenges

- US has used large scale stated preference studies in very large cases:
  - Exxon Valdez oil spill (pre-Oil Pollution Act); Montrose PBC, DDT chronic contamination; Deepwater Horizon oil spill
  - Results informed pre-litigation settlements
- US has also used this approach for recreational losses
Typical valuation strategy for typical oil spill

- Spill oils recreational beaches and wetland habitat
- Damage claim is based on the costs of a Restoration Plan
  1) Primary restoration to expedite recovery of wetland habitat
  2) To scale compensatory restoration to compensate for interim loss:
     • For lost habitat, trustees use habitat equivalency analysis to scale
     • For recreational losses, trustees estimate the lost value of recreation
US experience: key points

• Legal innovation of restoration-based damages measure now widely accepted as effective in producing case settlements, timely restoration
  • In part, its success is due to providing a framework for valuing ecological services that is simplified and deflects controversy from stated preference methods
• Courts have admitted Habitat Equivalency Analysis to scale compensatory restoration of ecological services
• Two factors are key to achieving equivalency in value at injury and compensatory project sites: project selection, and choice of ES metric
• Complex ES production function models hold future promise for capturing greater detail in ES relationships than HEA, currently modelling uncertainties remain great at fine scale required for litigation
International experience: key points


• Relative to US and EU, we found in a survey of 6 tropical countries (Brazil, Mexico, India, DRC, Indonesia, Philippines), their public liability statutes generally:
  – Cover a broader scope of harms
  – Include broader standing provisions
  – Include measures of damages that often were more narrow
  – Have regulatory language on ES that reflects the state of ES literature at time of adoption, though countries do not consistently cover all ES
References


Thank you!

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