Incorporating Non-Use Values into Regulatory Decision-Making

ACES Conference, December 4, 2018

Julie Hewitt

US EPA, Office of Water

Outline

- Theme for this session is Metrics → Indicators → Commodities → Valuation, with heavy emphasis on metrics and indicators
- The regulatory decision-making context
- Regulatory examples
- A general lesson for devising metrics and indicators for non-use valuation?
- Other challenges
- Disclaimer: The views expressed in this presentation are mine and do not necessarily reflect the views or policies of the EPA.

The regulatory decision-making context

- Types of regulations and their relationship to economics/BCA
  - Science-based or effects-based: BCA not a factor in decision making
    - Ex: state water quality standards
  - Technology-based: Take economic factors into account
    - Ex: ELGs must be economically achievable
  - Hybrid: include BCA among multiple factors
    - Ex: MCLs under SDWA
  - Multi-factor balancing:
    - Ex: CERCLA, FIFRA, TSCA
  - BC-based: use BC as the primary factor in decision-making
    - Ex: Consumer Product Safety Act

Source: CPR (2009)

Regulatory Examples: Non-use value in CWA regulations

- EOs 12866 and 13563
- OMB's Circular A-4: monetize benefits; if can't, then quantify benefits; if can't, then describe qualitatively.
  - Sometimes summarize this information in a table (next slide)
- Acknowledging difficulties in monetizing non-use benefits, ecologists can play a very significant role in helping us analyze the impacts of rules *quantitatively* – what are the best metrics and indicators of ecosystem services that are salient to the public and decision makers?
- Examples highlighting the broad approaches A-4 anticipates.

Example of summary table

TABLE IX–1.—BENEFIT CATEGORIES ASSOCIATED WITH WATER QUALITY IMPROVEMENTS RESULTING FROM THE METAL PRODUCTS AND MACHINERY EFFLUENT GUIDELINE

Benefit Category	Quantified and monetized	Quantified and nonmonetized	Nonquantified and nonmonetized
Human Health Benefits:			
Reduced cancer risk due to ingestion of chemically-contaminated fish and unregulated pollutants in drinking water	X		
Reduced non-cancer adverse health effects (*e.g.,* reproductive, immunological, neurological, circulatory, or respiratory toxicity) due to ingestion of chemically-contaminated fish and unregulated pollutants in drinking water		X	
Reduced non-cancer adverse health effects from exposure to lead from consumption of chemically-contaminated fish	X		
Reduced health hazards from exposure to contaminants in waters used recreationally (*e.g.,* swimming)			X
Ecological Benefits:			
Reduced risk to aquatic life		X	
Enhanced water-based recreation, including fishing, boating, and near-water (wildlife viewing) activities	X		
Other enhanced water-based recreation, such as swimming, waterskiing, and white water rafting			X
Increased aesthetic benefits, such as enhancement of adjoining site amenities (*e.g.,* residing, working, traveling, and owning property near the water)			X
Non-user value (*i.e.,* existence, option, and bequest value)	X		
Reduced contamination of sediments			X
Economic Productivity Benefits:[a]			
Benefits to tourism industries from increased participation in water-based recreation			X
Improved commercial fisheries yields			X
Reduced water treatment costs for municipal drinking water, irrigation water, and industrial process and cooling water			X

[a] The final rule regulates direct dischargers only. Therefore the selected option does not affect POTW operation. EPA, however, includes this benefit category when analyzing alternative options which considered the regulation of indirect dischargers (See Chapter 19 of the EEBA for the benefits analysis of alternative options).

Qualitative only

- Other water-based recreation (primary contact)
- Increased aesthetic benefits
- Reduced sediment contamination

Quantified, not monetized

- Reduced risk to aquatic life

Monetized

- Enhanced water-based recreation (secondary contact)
- Non-user value

Source: US EPA 2003, Metal Products & Machinery ELG FR notice

Non-use described qualitatively

- Current example: most state WQSs, where we declare that B justify C, and tend to not conduct full BCA (i.e., don't monetize benefits), because the rule isn't economically significant.
- From 2003 MP&M rule (table on previous slide)
  - Qualitative description of ecological benefit categories effectively amounts to list of reasons why we couldn't quantify:
    - imperfect understanding of the relationship between changes in effluent discharges and the specific ecological changes,
    - lack of water quality monitoring data for most locations, and
    - time lags between water quality changes and changes in species population and composition.

Non-use quantified, but not monetized

- Example benefit category under this approach
  - Count waterbodies with excursions of water quality criteria before and after a rule; non-use would focus on aquatic habitat criteria.
    - 2003, MP&M: at baseline, levels exceed acute criteria on 18 receiving reaches, and exceed chronic criteria on 353 receiving reaches. EPA estimated that the final rule would reduce acute exceedances by 9 reaches, and chronic exceedances by 9 reaches.
- Better to use metrics that are less the direct output of available WQ models, and more like something non-ecologists would readily understand
  - Presence/absence of species; change in abundance of keystone species; change in distribution of species
  - Consider metrics that can be expressed in native units as well as on 0 to 100 scale.

Non-use monetized, but not determinative

- 2015 Steam Electric Effluent Limitations and Guidelines
- Non-use is <6.7% of benefits
- Rule is atypical of WQ rules for having large market and air benefits
- Can't separate use and non-use value: $/ΔWQI per household * number of households, where $/ΔWQI is from meta-analysis of existing surveys

Category	Benefits (million 2013$)
Human health benefits	17.2
Improved ecological conditions and recreational uses	31.1
Market and productivity benefits	130.0
Air-related benefits	284.5
Total	**463.0**

Steam Electric Change in Water Quality

- Look only at changes in TN, TP, TSS, and metals
  - 13,229 unique NHD reaches affected (ΔWQI > 0), amounting to 19,573 miles of streams

Table 4-7: Water Quality Improvements from Final ELGs in All Benefiting Reaches

Change in WQI	Number of Inland Reaches	Percentage of Potentially Affected Inland Reaches (18,622 Reaches)	Reach Miles	Percentage of Potentially Affected Inland Reach Miles (27,421 Miles)
Option D				
ΔWQI = 0	5,393	28.96%	7,848	28.62%
0 < ΔWQI < 0.1	10,915	58.61%	16,066	58.59%
0.1 < ΔWQI < 1	2,111	11.34%	3,223	11.76%
1 ≤ ΔWQI < 5	178	0.96%	242	0.88%
5 ≤ ΔWQI < 10	13	0.07%	18	0.07%
10 ≤ ΔWQI	12	0.06%	23	0.09%
Total	**18,622**	**100.00%**	**27,421**	**100.00%**

Non-use monetized, but not considered

- 2014 Cooling Water Intake Structures at Existing Facilities
- Unlike most rules, conducted primary analysis via stated preference survey (we tried benefit transfer first , and nothing was satisfactory)
- Survey designed specifically to produce non-use benefits
- Valuation question format on next slide
  - Fish saved is the attribute that elicits value directly associated with effects of that rule. 98% of the fish saved are forage fish. Because of the 2%, this attribute is not purely about non-use
  - Other attributes, such as fish populations, and comm/rec fish populations that have a use value focus help tease out the use from nonuse

Example from US EPA 316(b) Regulatory Analysis—Fish Mortality and Population Attributes

THIS SURVEY IS SIMILAR TO A PUBLIC VOTE

The next part of this survey will ask you to consider different types of policies to protect fish, and indicate how you would vote. Effects of each possible policy will be described using the following scores:

Effect of Policy	What It Means
 Commercial Fish Populations (Fish Used by People)	A score between 0 and 100 percent showing **the overall health of commercial and recreational fish populations**. Higher scores mean more fish and greater fishing potential. A score of 100 means that these fish populations are at a size that maximizes long-term harvest; 0 means no harvest. **The current score in Northeast waters is 42.**
 Fish Populations (All Fish)	A score between 0 and 100 percent showing **the estimated size of all fish populations** compared to natural levels without human influence. A score of 100 means that populations are the largest natural size possible; 0 means no fish. **The current score in Northeast waters is 26.**
 Fish Saved (per Year)	A score between 0 and 100 percent showing the **reduction in young fish lost** compared to current levels. A score of 100 would mean that no fish are lost in cooling water intakes (all fish would be saved because of the new policy). **The current score in Northeast waters is 0.** This represents the status quo (no policy) with about 12% of plants already using advanced cooling systems.
 Condition of Aquatic Ecosystems	A score between 0 to 100 percent showing **the ecological condition of affected areas**, compared to the most natural waters in the Northeast. The score is determined by many factors including water quality and temperature, the health of aquatic species, and habitat conditions. Higher scores mean the area is more natural. **The current score in Northeast waters is 50.**
$ Cost per Year	How much the policy will **cost your household, in unavoidable price increases for products and services you buy, including electricity and common household products.**

Question 5. Assume that Options A and B would require a different mix of filters and closed cycle cooling in different areas. Assume all types of fish are affected. How would you vote?

Policy Effect NE Waters	Current Situation (No policy)	Option A	Option B
 Commercial Fish Populations (in 3-5 Years)	42% (100% is populations that allow for maximum harvest)	48% (100% is populations that allow for maximum harvest)	48% (100% is populations that allow for maximum harvest)
 Fish Populations (all fish) (in 3-5 Years)	26% (100% is populations without human influence)	28% (100% is populations without human influence)	30% (100% is populations without human influence)
 Fish Saved per Year (Out of 1.1 billion fish lost in water intakes)	0% No change in status quo	50% 0.6 billion fish saved	95% 1.0 billion fish saved
 Condition of Aquatic Ecosystems (in 3-5 Years)	50% (100% is pristine condition)	51% (100% is pristine condition)	52% (100% is pristine condition)
$ Increase in Cost of Living for Your Household	$0 No cost increase	$60 per year ($5 per month)	$72 per year ($6 per month)
HOW WOULD YOU VOTE? (CHOOSE ONE ONLY)	☐ I would vote for NO POLICY	☐ I would vote for OPTION A	☐ I would vote for OPTION B

A general lesson for devising metrics and indicators for non-use valuation?

- Meta-analysis of SP values is from widely disparate literature
  - General improvements; fish populations; air deposition; nutrients and algal blooms; stormwater runoff; pesticides & PCBs; nonnative species; etc.
- Metrics in 316(b) survey were designed for analyzing that regulation
  - Other contexts in which those values could be used?
- Lessons for general ecosystem services contexts?
  - Select ES commodities likely to be important for future decision-making
  - Identify metrics associated with total value, and metrics associated with use value for that commodity.
  - Combine both in a choice experiment survey question format
  - The combination is what allows analysts to tease out tradeoffs between these (to isolate nonuse?) from responses to choice experiment questions use-based ES and non-use ES.

Other challenges in identifying metrics & indicators

- Reference condition: in wetlands context, it's the best of what's left, whereas in forestry context, it's possible to model historical reference case.
- Discrete vs. continuous
- Multimetric indicators
  - Carry baggage
- Uniqueness: if an ecosystem service is unique, then it is by definition scarce, and scarcity drives value. But is the converse/contrapositive true: that if a resource is not so unique, then it must have limited non-use value?
  - Freeman: small non-use values, widely held, can amount to significant total

Sources

- Center for Progressive Reform. 2009. “Comments Regarding Executive Order on OMB Regulatory Review.” Available at http://www.progressivereform.org/articles/CPR_Comments_New_EO_Reg_Rev.pdf
- Freeman. 1993. The measurement of environmental and resource values resources for the future.
- OMB. 2003. Circular A-4. Available at https://obamawhitehouse.archives.gov/omb/circulars_a004_a-4/
- Randall, Ives & Eastman. 1974. “Bidding Games for Valuation of Aesthetic Environmental Improvements,” *JEEM*, 1:132-149.
- US EPA. 2003. “Effluent Limitations Guidelines and New Source Performance Standards for the Metal Products and Machinery Point Source Category,” 68 FR 25686.
- Nine articles in 2018 *ERE* special issue, edited by V. Kerry Smith

Our Core Questions

- What biophysical measures usefully represent existence values?
- What is the “right” conceptual definition for “reference conditions”?
- How do different organizations use information on existence value in biophysical or value terms?