

SCIENCE AND REGULATION

Deciphering dueling analyses of clean water regulations

Hundreds of millions of dollars in benefits were discarded

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Government agencies are often required to conduct benefit-cost analyses for major regulatory actions (1). When benefit-cost analysis is consistent with best practices, it provides a systematic and science-based approach for informing policy and regulatory decisions. It has been particularly important for health and environmental regulations. Yet the wide disparity between the quantified benefits in two recent and conflicting regulatory impact analyses (RIAs) related to the U.S. Clean Water Act (CWA) has the potential to undermine the credibility of agencies' benefit-cost analyses. It also highlights the need for a more systematic protocol that ensures the information base is adequate and appropriately applied to support agency analyses and public decision-making. This includes applications in the context of the CWA, which is the focus of an 11 October hearing in the U.S. Supreme Court.

In 2015, the Environmental Protection Agency (EPA) and the Army Corps of Engineers (ACOE) issued the waters of the United States (WOTUS) rule, which sought to update

and clarify which waters are subject to CWA provisions (2). The key issue was the extent of connectivity between navigable waterways and different types of upstream water bodies, including wetlands. The effect of the 2015 WOTUS rule was to expand coverage of the CWA. Whereas supporters of the rule contend that it is consistent with the CWA and related Supreme Court decisions, critics argue that it represents regulatory overreach by the Obama administration. Presently, the 2015 WOTUS rule is not being implemented because of a court-ordered stay based on questions about which courts have jurisdiction to hear WOTUS challenges. The upcoming Supreme Court hearing is scheduled to begin oral arguments on this case.

In the meantime, in February 2017, President Trump issued an Executive Order that called for a "review" of the 2015 WOTUS rule (3). Then, in June 2017, the EPA and ACOE proposed a new rule that would rescind the Obama administration's WOTUS rule (4). The 2017 proposed rule, which is making its way through the rule-making process, would imply that the jurisdictions and associated connected waterways added by the 2015 rule would no longer be subject to the CWA.

Both rules have been subject to benefit-cost analysis by EPA and ACOE as part of the RIAs (5, 6). Both RIAs deal with what is ostensibly the same set of changes in water-related resources, but in opposite directions.

Despite evidence, benefits of policies to protect wetlands have been ignored. Coastal waterway and marshland along the Georgia Sea Islands, USA, is shown.

This means that the categories of costs and benefits are reversed in the two analyses, but they can be interpreted in roughly the same way. From the perspective of the 2015 WOTUS rule, the two analyses come to starkly different economic conclusions. The cost estimates remain unchanged, but the quantified benefits in 2017 decrease by almost 90%. The difference stems from a decision in the 2017 RIA to exclude wetlands-related benefits—which the same agencies concluded 2 years earlier ranged from \$300 million to \$500 million per year. The effect is an overturning of the initial finding that the benefits exceed the costs of implementing the 2015 WOTUS rule.

Without endorsing the specific findings of the 2015 RIA, we find no defensible or consistent basis provided by the agencies for the decision to exclude what amounts to the largest category of benefits from the 2017 RIA. We believe it is important to highlight the implications of the 2017 decision to designate wetlands-related benefits as unquantified, which is inconsistent with best practices for conducting benefit-cost analysis.

The 2017 RIA does not quantify wetland-related benefits because the studies used to estimate these benefits were judged to be too old, having all been conducted prior to 2000. The stated reasons for their exclusion are as follows: Older studies introduce uncertainty because public attitudes toward nature protection may have changed; the studies may not have used the most recent methodological approaches; and the limited number of studies make it difficult to validate the estimates. The 2017 RIA also argues that more

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recent studies are not available.

It is important to note, however, that the 2017 RIA does not apply a consistent criterion for when studies are considered “too old” to produce reliable benefit estimates. If either the date when data were collected or when a study was published is the standard for inclusion or exclusion (i.e., prior to 2000 in this case), then the standard should be applied uniformly. Yet the benefit measures retained in the 2017 RIA for point sources of pollution are based on data collected in 1983 and published in 1993 (7). Thus, if the stated exclusion rule were applied consistently, this would imply no quantification of benefits for any categories of water-quality effects. But this is incompatible with decades of scientific research on the estimates of economic benefits for water-quality improvements and on the connectivity of streams and wetlands to downstream waterways (8). Importantly, assuming all or most benefits are unquantifiable, and thus implicitly assigning \$0 for excluded benefits, undermines the usefulness of conducting a benefit-cost analysis.

The age of studies alone is not a defensible criterion for excluding categories of economic benefits. RIAs related to environmental quality should take advantage of all the credible information available using state-of-the-art benefit-transfer methods to calibrate existing value estimates to meet the needs of each new rule (9). In addition, although the agencies note an absence of recent wetland valuation studies, our review of the literature uncovered at least 10 studies published since 2000 that could be considered for expanding the body of knowledge on wetland values [see supplementary materials (SM)].

The 2017 RIA correctly notes that methods to measure economic values for changes in environmental quality have advanced over the last three-plus decades (9). However, the decision pertaining to wetlands-related benefits is inconsistent with best practices within the current economics literature. Before studies are excluded from consideration, best practice requires documentation that either they did not use methods that would meet contemporary standards or that estimates could not be adjusted to reflect uncertainty based on newer research. The 2017 RIA did not provide such documentation, and well-established methods for conducting benefit-cost analysis suggest that whenever possible, best estimates should be presented along with a description of the uncertainties (10, 11).

We also find the logic for excluding wetland-related benefits inconsistent with empirical evidence. The 2017 RIA asserts that public attitudes toward nature protection may have changed. This is important because attitudes are often used to gauge public sup-

port for environmental policies (12) and the credibility of estimates for willingness-to-pay as the basis for economic benefits (13). Based on data from the widely used and publicly available General Social Survey (see SM), the figure shows the trend since 1973 in U.S. public opinion about spending to improve and protect the environment. These data show no evidence to suggest that preferences for nature protection have declined. The percentage of Americans who think spending on the environment is “too little” or “about right” has been very stable, averaging 89% since 1986. Moreover, the percentage of Americans who think that pollution in rivers, lakes, and streams is at least somewhat dangerous also has remained very stable and over 90% since data collection began in 1993 (see fig. S2) (14).

“...we find no defensible or consistent basis...to exclude... the largest category of benefits from the 2017 regulatory impact analysis.”

The discrepancy between the 2015 and 2017 RIAs from the same government agencies serves as a call to action for an agency-research community partnership to produce relevant and credible information on benefit and cost measures for environmental policies. There are two challenges. One involves a process that ensures there will be studies that quantify economic values for a consistently defined set of environmental services. In addition, there is the need for a framework to organize the collection and maintenance of benefit estimates from these studies. Unfortunately, the incentives for academic researchers to conduct and publish applied studies are weak because new methods and questions tend to be favored in the peer-reviewed publication process. But, importantly, to systematically measure environmental benefits and update them for use in RIAs, high-quality applied studies need to be conducted at periodic intervals through time.

In market economies, consistent records of exchanges provide an important component of the information required to update important economic indicators, such as the consumer price index (CPI). This index is used, for example, to adjust retirement benefits and allowances for poverty alleviation. There is also a clear protocol for how data are collected and used to construct the CPI index. There are no such analogs in terms of a systematic process that ensures the primary research is conducted to maintain measures of environmental benefits over time. The devel-

opment and refinement of comparable protocols with systematic data collection should emerge as a research priority to provide improved methods for the EPA and other agencies that rely on credible RIAs to support rule making and policy decisions.

These needs are particularly compelling for decision-making on policies related to the endowment of key natural resources we will leave for future generations, such as services provided by water quality in rivers and streams. More generally, careful benefit-cost analyses, supported by adequate data on both benefits and costs, create incentives for policy-makers to focus on the key question: If the benefits exceed the costs of an action, what are the issues that might justify inaction? Although there may be reasonable answers, far less justification is needed for inaction when the costs exceed the benefits.

Beyond an economics perspective, inconsistencies in the benefit estimates between the 2015 and 2017 RIAs may also factor into challenges to the Trump administration's proposed rescission of the 2015 WOTUS. Questions are sure to arise about whether this proposed rule satisfies a “reasoned explanation” precedent or constitutes an “arbitrary or capricious” decision according to the Administrative Procedure Act (15). In the meantime, future changes to the definition of U.S. waters subject to the CWA may depend on a horserace between cases currently before the courts and the Trump administration's timeline to carry out its rule-making. ■

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