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Cost-Benefit Analysis at the Supreme Court: Cooling Water v. Fish

Julie A. Hewitt

This is the story of a recent U.S. Supreme Court case on the use of cost-benefit analysis at the U.S. Environmental Protection Agency (EPA) for a regulation issued under the Clean Water Act (CWA). The case is *Entergy Corp. v. Riverkeeper, Inc., et al.* The case was not about the quality of the cost-benefit analysis, nor the fact that EPA conducted one, but whether EPA had CWA authority to base regulatory decisions on cost-benefit. I close with thoughts about an alternative Chevron legal test that acknowledges the state of ecosystem valuation.

Key Words: regulatory analysis, ecological benefits, Chevron test

This is the story of a recent case heard in the U.S. Supreme Court on the use of cost-benefit analysis as applied to a U.S. Environmental Protection Agency (EPA) regulation issued under the Clean Water Act (CWA). Notwithstanding its characterization in the title, the case is *Entergy Corp. v. Riverkeeper, Inc., et al.* To save economists from being disappointed at the end, the case was not at all about the quality of the cost-benefit analysis, nor the fact that EPA conducted one, but whether EPA, also a party to the proceedings, had the authority under the CWA to base its decision making in the regulations on cooling water intake structures on cost-benefit considerations. The story is followed by some related observations, and the paper closes with my thoughts about the well-known legal test—the Chevron two-step test—applied to the legal question here.

Foreshadowing

Both the story and my concluding remarks depend on the legal test applied by the Supreme

Court, making it helpful to the reader to describe the test in some detail. The Constitution grants to Congress the power to make laws; in writing laws, Congress often instructs agencies to issue implementing regulations. Regulated stakeholders and other interested parties (often including citizens) may bring suit if they think an agency has exceeded its authority as delegated by Congress through the statutes. A hallmark of environmental statutes in particular is that they grant broad discretion to agencies such as the U.S. Environmental Protection Agency, through vague language that may be open to different interpretation by different stakeholder groups, and requiring resolution [Morganstern (1997, p. 19), quoting William D. Ruckelshaus, former EPA Administrator: “The people who run EPA are not so much executives as prisoners of the stringent legislative mandates and court decisions that have been laid down”].

A case surrounding just such an issue, known as *Chevron U.S.A., Inc. v. Natural Resources Defense Council, Inc., et al.*, made it to the Supreme Court in 1984. The case was about the legal interpretation of a Clean Air Act clause; the Carter administration adopted one interpretation, but a few years later the Reagan administration adopted (through regulation) a separate one. The environmental group, the Natural Resources Defense Council, sued the EPA and won in the lower courts; Chevron appealed the case to the Supreme Court, which essentially agreed with EPA’s interpretation. Out of the case was born one of the most cited legal principles, the so-

Julie A. Hewitt is an economist and branch chief at the U.S. Environmental Protection Agency in Washington, D.C.

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The opinions expressed in this paper are solely the author’s, do not establish or affect legal rights or obligations, and do not necessarily reflect the views of the U.S. Environmental Protection Agency; no official endorsement should be inferred. Furthermore, this paper describes a regulation that is now suspended, pending promulgation of a new regulation. It should be noted that facts and figures associated with the original, suspended rule may have changed since 2004; their appearance here is simply a citation, not a representation of currency.

called Chevron two-step test, regarding an agency's authority to interpret a statute. A key paragraph from the Supreme Court decision:

When a court reviews an agency's construction of the statute which it administers, it is confronted with two questions. First, always, is the question whether Congress has directly spoken to the precise question at issue. If the intent of Congress is clear, that is the end of the matter; for the court, as well as the agency, must give effect to the unambiguously expressed intent of Congress. If, however, the court determines Congress has not directly addressed the precise question at issue, the court does not simply impose its own construction on the statute, as would be necessary in the absence of an administrative interpretation. Rather, if the statute is silent or ambiguous with respect to the specific issue, the question for the court is whether the agency's answer is based on a permissible construction of the statute [*Chevron* 1984, pp. 842–843].

Thus, if the statute is unambiguous, or if the agency's interpretation is not reasonable, the Supreme Court, following the precedent it set in the Chevron case, will return the case to the lower courts. The Chevron test serves as a check to keep lower courts from imposing their own interpretations, actions which are viewed as courts usurping Congress's power to make laws—a power not granted in the Constitution to the judicial branch of government.

Background

The CWA established a comprehensive regulatory program to “restore and maintain the chemical, physical, and biological integrity of the nation's waters.” Several elements of this program are the prohibition on discharges of pollutants by point sources unless authorized, and the authority of the EPA and states to issue permits, under the National Pollution Discharge Elimination System (NPDES), that regulate discharges from individual point sources. Permits are good for a period of five years, and may be renewed. Section 316(b) of the CWA provides that “any standard ... applicable to a point source shall require that the location, design, construction and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact.” This section of the CWA focuses not on the discharge of pollutants but on the intake of cooling water, although both goals are implemented through the NPDES permit program.

Section 316, under the general header of “thermal discharges,” was added to the CWA in 1972.

In 1976, EPA issued regulations under §316(b), which were then challenged by industry, and overturned in 1977.¹ As a result of separate litigation, EPA entered into a consent decree in 1995 (later amended) which set a timetable for issuing regulations under §316(b) in three phases with deadlines. The Phase I rule applied to new facilities, and was issued in 2001 (U.S. EPA 2001). The Phase II rule applied to existing electric generation facilities withdrawing at least 50 million gallons per day (MGD) of cooling water and was issued in 2004 (U.S. EPA 2004a). The Phase III rule applied to existing electric generation facilities withdrawing less than 50 MGD, all existing manufacturing facilities, and new offshore oil and gas extraction facilities, and was issued in 2006 (U.S. EPA 2006). Prior to these regulations, and in the absence of national standards, permit writers must address §316(b) permit requirements on a case-by-case, best professional judgment basis.

The Phase II regulation is the focus here because it was the phase for which litigation reached the Supreme Court; however, the Supreme Court's decision effectively applies to §316(b) and thus to all three phases. Electric generation facilities withdrawing at least 50 MGD collectively withdraw 214 billion gallons of water per day, while all electric generation facilities were estimated to account for nearly half of all withdrawals of water for all purposes in 1995 (U.S. EPA 2004a, p. 41586). The Phase II rule covered 554 facilities in the United States withdrawing at least 50 MGD. As the largest withdrawing facilities in the electricity generation sector, Phase II facilities are responsible for 90 percent of the cooling water withdrawals from this sector (U.S. EPA 2004a, p. 41581).² These facilities also represent just over half the electricity-generating capacity in the United States (U.S. EPA 2004b, p. A3-13).

Two principal methods of withdrawing cooling water are employed: once-through and closed-cycle cooling. Once-through cooling is as its name suggests: cooling water is withdrawn, run through the condenser unit, and then discharged back to

¹ See Section III.C, p. 41582, of the preamble in U.S. EPA (2004a) for more background on the historical development of these regulations. Harrington (2009) provides a succinct summary.

² For perspective, a facility that operates its cooling water intake structure at a rate of 95 MGD would drain an Olympic-sized swimming pool every 10 minutes.

the waterbody. Closed-cycle cooling recirculates water, though it is not a completely closed cycle; evaporative losses and/or chemical concentration resulting in blow-down require continual withdrawal of water. Closed-cycle cooling operations can reduce cooling water needs by up to 98 percent over once-through systems withdrawing from freshwater bodies, and up to 96 percent withdrawing from saltwater bodies. Whether once-through or closed-cycle, all intakes have some form of screening device at the intake point, to prevent trash, debris, and larger fish from being taken up with the cooling water. For the most efficient heat exchange, condenser tubing is typically no larger than three-quarters of an inch in diameter, and facilities need to keep objects out of the condenser system, or the generating unit must be shut down. This first level of barrier is often referred to as a trash rack. Finer screening devices are possible, but to maintain intake flows, the intake must then be physically larger.

The main closed-cycle cooling technology employs cooling towers, of which there are two types: hyperbolic towers which use the geometry of natural air drafts to cool the recirculating cooling water,³ and mechanical evaporative cooling towers which use mechanical fans to push air through smaller modular units. Although the terminology is not always consistently used, both tower types impose an energy penalty relative to once-through cooling. Fans and pumps require electricity to operate, meaning net power generation available for sale is reduced, while reduced turbine efficiency due to the warmer temperature of recirculated cooling water (relative to once-through cooling water) during warmer weather results in a seasonal loss of peak generation capacity, depending on, among other things, whether or not the condenser is designed for once-through or closed-cycle cooling.

The basic difference between these two main methods of dissipating waste heat—once-through and closed-cycle cooling—is that once-through systems make greater use of natural capital for which the facility does not bear the direct costs,

while the closed-cycle systems require more human-made (financial) capital investments that can be quite costly. In both cases it is society at large, and commercial and recreational fishermen in particular, that bear the burden of the impacts to ecosystems. What are the differences in the environmental impacts of these two types of systems?

Section 316(b) exists because of the concern that the intake of cooling water was causing harm to aquatic life, particularly fish and shellfish, of all life stages, including eggs, larvae, juveniles, and adults. There are two main resulting types of harm. Fish longer than three-eighths of an inch can be trapped or pinned against standard coarse mesh intake screens by the force of the intake flow, sustaining injuries from which they do not recover, such as descaling. This effect is called impingement mortality (IM). Fish smaller than three-eighths of an inch in diameter can pass through the screens, making a trip through the condenser where they are subject to thermal and mechanic stresses that result in death. This effect is called entrainment (E). Collectively, these impacts are known as IM&E. The focus is restricted to organisms that are killed—for entrainment, this is nearly always 100 percent of organisms, while for impingement, it can be much less than 100 percent and depends critically on the operation and design of the screens (including the through-screen velocity) and the presence and proper design and operation of separate fish-friendly returns; investments required to make screens and returns fish-friendly are not necessarily very costly.

In the Phase I rule, EPA employed a best technology available (BTA) design standard, that is, EPA required new facilities to employ certain design characteristics, inducing many new facilities to employ the capital-intensive closed-cycle cooling. New facilities generally have lower costs for the same technology than existing facilities, unless the retrofit of technology was anticipated in the original design for existing facilities. In the suspended Phase II rule, EPA employed a BTA performance standard, setting a range of numeric performance levels to be achieved, without requiring a specific design, giving facilities more flexibility to determine their approach to compliance.

The performance ranges were based on a suite of fourteen technologies [really, combinations of technologies; U.S. EPA (2004d, p. 2-1)] that resulted in a requirement that facilities reduce im-

³ Hyperbolic towers are indisputably large and may be seen from miles away. They are often taken as symbols of nuclear facilities, but some coal-fired closed-cycle plants use hyperbolic towers, while some nuclear closed-cycle plants do not; their use at Three Mile Island, site of the worst U.S. nuclear accident, in 1979, is perhaps responsible for this misconception.

pingement mortality by 80 to 95 percent, and entrainment by 60 to 90 percent. Furthermore, the rule made a distinction between inland facilities and estuarine/coastal/Great Lakes facilities by requiring both impingement and entrainment controls at the coastal and Great Lakes facilities, but requiring only impingement controls at inland facilities. In effect, many of the broadcast spawning species are marine species, and many nesting species are freshwater. However, facilities were required to conduct a study to determine the baseline IM or IM&E levels against which their percent reduction(s) was to be measured.

When setting national performance standards under a technology-based portion of the statute, EPA must demonstrate that these performance levels are achievable with technologies that are commercially available and economically achievable. A direct quote from the preamble to the suspended Phase II regulation is instructive:

Although closed-cycle, recirculating cooling is not one of the technologies on which the performance standards are based, use of a closed-cycle, recirculating cooling system would always achieve the performance standards and therefore, facilities that reduce their flow commensurate with closed-cycle, recirculating cooling systems are deemed to have met performance standards. ... While EPA based the requirements of the new facility rule on the performance standards of closed-cycle recirculating systems, EPA has determined that this technology is not economically practicable for many existing Phase II facilities [U.S. EPA 2004a, p. 41601].

The rule also provided for several compliance alternatives for facilities. First, any facility that already employed closed-cycle cooling or reduced flows commensurate with closed-cycle cooling were deemed to be in compliance. Facilities could also use restoration measures to comply—for instance, operating a fish hatchery to restore populations of affected species. Facilities could use a pre-approved technology, such as fine-mesh cylindrical wedgewire for freshwater facilities with adequate sweeping velocity, through-screen velocity of less than 0.5 feet per second, and when used for 100 percent of intake flow. Facilities could also apply for a cost-cost variance, where if a facility could demonstrate that the facility's actual costs of compliance were significantly greater than the costs EPA estimated for that facility at the time of the rulemaking, the facility could be subject to less stringent requirements. And finally, a facility could apply for a

cost-benefit variance, by demonstrating that the facility's actual costs of compliance were significantly greater than the benefits at that facility. EPA specified some requirements for supporting analysis for facilities applying for the cost-cost or cost-benefit compliance alternative, such as assumptions on discount rates and facility downtime calculations in the cost-cost case, as well as describing the possibility of using a stated preference (SP) study to monetize non-use values, and perhaps requiring that the SP study undergo peer review, although attempting to monetize non-use benefits was not strictly required.

Efficiency and the Cost-Benefit Compliance Alternative

I will now focus on the cost-benefit compliance alternative because it is the one compliance alternative directly related to the legal question before the Supreme Court. First, in a world of perfect information, this compliance alternative is one way to ensure an economically efficient regulation. With the aforementioned perfect information, one could divide all potentially regulated facilities into two groups: those for which adoption of technology generates social benefits (SB_i , where i denotes the facility) exceeding social costs (SC_i), and those for which adoption means SC_i that exceed the SB_i generated. Society is clearly best off when only the facilities for which $SB_i > SC_i$ adopt the technology and the others do not. Why? Add any one facility in the non-adopter group, where $SB_i < SC_i$, to the set that make the technology investments, and social welfare *rises* by $SB_i - SC_i$, which is a *negative* amount; subtract any one facility in the adopter group, where $SB_i > SC_i$, from the set that make the technology investments, and social welfare *falls* by $SB_i - SC_i$, which is a *positive* amount. Thus, classifying facilities as to whether their investment adds to social welfare or detracts from it provides assurance that society as a whole is as well off with the regulation as is possible.

Of course, this compliance alternative would not be necessary in a world of perfect information, if social welfare maximization were really the goal, because the regulation would be written such that only those facilities where compliance is welfare-enhancing would be required to comply in the first place. However, it is well recognized that EPA need only estimate costs in ana-

lyzing regulations, not know costs with precision. Thus, this compliance alternative can serve as an escape valve for facilities whenever the Agency has underestimated their costs, and ensures the end result of social welfare maximization—in a world of perfect information.

Several violations of the perfect information assumption cast doubt on the optimality of the above general proposition in practice. First, costs are much more straightforwardly estimated than benefits, and if there are categories of social benefits that cannot be monetized (see below), the result is monetized social benefits (SB_i^S) being an underestimate of social benefits ($SB_i^S < SB_i$). This means we can no longer be sure that social welfare is maximized when we substitute the rule, $SB_i^S > SC_i$, in determining which facilities are required to comply with the regulation. If we were able to additionally require compliance at some of the facilities where $SB_i^S < SC_i$, social welfare would still be enhanced, although without monetizing all categories of benefits, we cannot say for how many and which facilities this would be true. Second, it can be difficult to ascertain the social benefits of even those categories that are monetized. The social benefits generated by one facility may be affected by other facilities located on the same waterbody, because benefits generated by compliance at one facility may increase with compliance at another facility—benefits are cumulative. Another way to say this is that the total social benefits of compliance at facilities j and k , or SB_{j+k} , is larger than $SB_j + SB_k$, when the latter represent estimates of benefits generated by action taken at each facility only; a similar argument applies to a single facility over time. In addition, when a species subject to IM&E is a species that migrates, an estimate of benefits based on a local study may underestimate true SB_i .

Third, a facility's cost of compliance is not necessarily equal to the social cost of that facility's compliance; the former measures costs from the facility's viewpoint, whereas the latter takes society's viewpoint. (It's perfectly natural for a facility to focus on its compliance costs; but it is clearly part of EPA's responsibility to the general public to consider the differences between the facility's viewpoint and the larger social viewpoint. Congress certainly anticipated that CWA regulations would result in the closure of some facilities, though was concerned enough to guard against the possibility of widespread closures.)

There are a number of reasons why the social cost could *exceed* a facility's cost of compliance—e.g., social costs are pre-tax while the facility's costs are after-tax, and facilities do not fully bear administrative costs though society does. There are also a number of reasons why the social cost could be *less* than a facility's cost of compliance, including that compliance costs assume a pre-regulation level of output though price effects may reduce output (U.S. EPA 2000, pp. 113, 124–125). Also, facility downtime figures into a facility's compliance costs (through lost operating revenue), though other facilities will be dispatched to make up the lost production, so that this component of social costs consists only of any differential in the costs of production at the other facilities relative to the complying facility (U.S. EPA 2004b, pp. B1-2 to B1-4). Downtime estimates of the suspended Phase II rule were significant (Harrington 2009, p. 167). To summarize, the relationship between a facility's compliance costs and the social costs at that facility is ambiguous, while the social benefits are larger than the monetized benefits. Applying the cost-benefit variance is thus fraught with far more difficulty than the theoretical arguments in favor of incorporating it would admit.⁴

Benefit Estimation

How did EPA estimate benefits of the suspended regulation? Three metrics were used that attempt to capture IM&E losses at all life stages: foregone age-1 equivalents, foregone fishery yield, and foregone biomass production. The age-1 equivalent metric is based on data from IM&E characterization studies conducted at facilities, which produce counts of losses of fish by life stage; these counts from sampling episodes of certain time periods are then extrapolated to annual losses. These annual losses by life stage are then multiplied by a factor that accounts for the cumulative probability of survival from that life stage to age one, where the cumulative probability of survival is based on both natural mortality and, for harvested species, harvest mortality as

⁴ See §125.95(b)(6)(i) of the regulation (U.S. EPA 2004a, p. 41690) for details on the cost information a facility would have been required to submit as part of the cost-benefit compliance alternative; the distinctions between a facility's compliance costs and social costs were not discussed in the regulation.

well. Generally, the cumulative survival factors used for early life stages (entrainment losses) reduce by several orders of magnitude the losses in number of organisms when converting to age-1 equivalents (e.g., dividing by a number in the thousands), while for the later life stages, the age-1 equivalent tends to be a larger number than the losses in organism count units. Finally, these normalized losses can be summed to produce an estimate of lost organisms in a metric that does not abstract from the high mortality rate of the early life stages. However, because so many organisms lost are through entrainment of early life stages, overall IM&E losses expressed in age-1 equivalent terms are smaller than counts of organisms.

Foregone fishery yield is a measure, in units of pounds, of fish that are unavailable for harvest due to losses to IM&E. In addition to the kind of information used in the age-1 equivalent losses calculation, if we have average weight at each age and age-specific harvest rates for harvested species, we can calculate the lost yield in pounds. One doesn't need to know the population or yield of the fishery, only size-at-age and stage or age-specific rates of natural mortality and fishing mortality. If we are willing to assume that IM&E don't affect these rates directly, then yield changes are directly proportional to changes in recruitment. This model also depends on the assumption that IM&E losses are a minor source of mortality in comparison to other sources of mortality (e.g., fishing, predation). Foregone yield is then decomposed into foregone commercial and foregone recreational yields; recreational yields are then converted back into count of lost fish. Note that this metric covers only recreationally and commercially harvested species.

Foregone biomass production uses similar data, except that the metric of interest is pounds of biomass lost at each life stage, and for all species, not just those that are harvested. It is a current snapshot measure, including only the weight of organisms in their current life stages and the foregone growth of these same organisms in the year of analysis, and not growth over the expected lifetime of the organism. Forage fish, which may include the very young of recreational and commercial species as well as species that are never harvested, are also analyzed in this model.⁵

⁵ Modeling is more challenging because strict distinctions between predator and prey cannot be made on the basis of species alone.

The foregone production of these fish is also converted to foregone production of commercial and recreational fish using a trophic transfer model—the trophic transfer model requires a factor that relates the conversion of forage species to species of higher trophic levels (or higher up on the food chain).

At the time of the analysis to support the Phase II rule, EPA had access to IM&E characterization studies collected at 46 facilities, spread across seven regions of the country (five coastal regions, the Great Lakes, and one inland region). The study facilities in each region were extrapolated to estimate losses at all facilities within the region, on the basis of observed cooling water intake flows (available for all facilities), and adjusted for technologies currently in place. Separate extrapolations were made for impingement and entrainment.

Why didn't EPA simply model fish populations, including IM&E effects, to see if IM&E have an impact on fish populations before developing the regulation? While this task is not impossible, it would have required vastly more resources and time than the Agency had available, and is only one of many questions associated with this regulation that could have been answered. Fish recruitment modeling, as fisheries scientists know, is a challenging and fundamental problem in fisheries research. Fish are subjected to many stressors that are difficult to quantify, and determining the relative impact of any one stressor among the others is generally not possible, making it extremely difficult to determine whether a stressor has a significant impact on fish populations or not. There are, however, studies using trophic level dynamics that have shown entrainment losses especially to have an impact on the production of valued commercial and recreational species—for example, losses of bay anchovy and silversides affecting striped bass, bluefish, and weakfish populations (Summers 1989). This work is not readily extended to all species pairings.

The Story, Beginning with Promulgation

The analysis of the suspended Phase II rule is detailed in a set of supporting documents (U.S. EPA 2004b, 2004c, and 2004d). The rule was expected to apply to 554 facilities, though some were already deemed to be in compliance, and no in-

cremental costs were calculated for these facilities. The 554 facilities were projected to have contributed to the loss of 3.4 billion age-1 equivalents each year (a larger number if expressed as a count of lost organisms), amounting to 165 million pounds of foregone fishery yield (harvested fish), or 717 million pounds of foregone biomass (including trophic transfer of forage fish to commercial and recreational fish). The rule was expected to reduce lost organisms as measured on an age-1 equivalent basis by 41 percent, foregone fishery yield by 39 percent, and foregone biomass by 30 percent. Prevention of recreational losses was valued using a random utility model, and prevention of commercial losses was valued using a producer surplus model where commercial prices were assumed not to change. Combined, the prevented recreational and commercial losses represent just the use value associated with 1.8 percent of the total prevented losses of fish, in age-1 equivalent terms. The remaining 98.2 percent of fish—*forage fish*—were not valued at all because non-use benefits were not monetized, and were quantified only to the point of describing IM&E losses using the three metrics.⁶ In addition, impacts on turtles, shellfish, mammals, and birds were not monetized.

The social costs of the rule were expected to be, in 2002 dollars, \$389 million annually. The monetized benefits of the rule were expected to be \$83 million annually; the monetized benefits are associated with 1.8 percent of the IM&E losses in age-1 equivalents. This resulted in a cost-to-monetized-benefits ratio of 4.7, which is above one; a ratio of less than one would indicate that society is clearly better off with the rule than without, but the converse is not true when potentially significant benefits are not incorporated. A break-even analysis of non-use benefits suggested that if households in counties with a facility taking action to comply were willing to pay \$5 per household annually, this would be sufficient for the overall cost-to-benefit ratio to equal one. In the end, EPA issued the regulation, although there

was no specific judgment regarding this break-even non-use value.

EPA articulated a number of considerations in determining the best technology available to minimize adverse environmental impacts (see section VII of the preamble, U.S. EPA 2004a, pp. 41598–41610) on which the performance standard was based. These considerations include: availability, feasibility, flexibility, waterbody type (because reproductive strategies differ by waterbody), uncertainty, cost-effectiveness, economic practicability, approved designs, establishment of national performance standards, administrative burdens, restoration as a technology, and the potential for trading. The rule was signed by the Administrator on February 16, 2004, and published in the Federal Register on July 9, 2004, with an effective date of September 7, 2004; after the effective date, facilities were expected to comply with the rule on the next permit reissuance, though facilities with permits ending within the first four years after the publication date were eligible for a three and a half year extension to conduct the appropriate studies.

Appeals Court Case

Under §509 of the CWA, any interested person may request a review of EPA actions within 120 days of promulgation, if the suit is filed in the federal Circuit Courts of Appeal. EPA was sued by stakeholder groups on all sides of the regulation: environmental groups, industry groups, and several states (many states, through demonstrating that they have the capability, have been delegated the authority to implement the NPDES program at the state level). Their cases were consolidated into one, which was heard in the Second Circuit Court of Appeals.

In the federal appeals process, the parties suing (the petitioners) must first file their briefs, articulating their arguments. Then the party being sued (the respondents) files its brief, having the benefit of seeing the arguments in the petitioners' brief. Then petitioners get to file a reply brief, having the benefit of seeing the arguments in the respondents' brief. Depending on the court's schedule, filing briefs can take several months. The next step is oral argument, which for this case occurred on June 8, 2006. Finally, the court issues its written decision, which occurred on January 25, 2007 (*Riverkeeper* 2007).

⁶ EPA attempted to value non-use benefits, but the various methods attempted, each short of conducting a stated preference survey, were not ultimately judged to be adequately successful to be included in the final analysis. EPA did attempt to conduct a stated preference study to capture non-use benefits in the Phase III rulemaking, although a combination of the level of rigor required and the court-ordered deadline for the rulemaking ultimately proved decisive in preventing the agency from completing the survey. See U.S. EPA 2006 (p. 35017).

What arguments did petitioners make? Environmental groups argued that restoration was not a technology (a point they successfully argued in a previous case on the Phase I regulation, also in the Second Circuit), that performance ranges didn't require facilities to aim for the highest performance possible within the range, and that cost-benefit analysis was not permissible under the language of §316(b). States argued that because closed-cycle cooling was not part of the suite of 14 technologies on which EPA based its performance ranges, this meant they could not compel a facility to employ closed-cycle cooling to meet §316(b) requirements, and argued that closed-cycle was more effective than the suite of 14 technologies. Industry argued several procedural points but was also motivated to argue for the retention of the restoration provision. Industry also argued that §316(b) could not apply to existing facilities because the language of the statute says "location" and only new facilities can choose location.

In their decision, the three-judge panel of the Second Circuit "granted in part and denied in part" the petition of environmental stakeholders; "granted in part, denied in part and dismissed in part" the petition of industry stakeholders; and finally "remand[ed] to the EPA the provision establishing BTA" as well as remanding other provisions due to inadequate notice and comment opportunity. The Second Circuit cited the Chevron two-step test, as described above, in its decision.

The Second Circuit determined that the CWA language did not allow a cost-benefit comparison, because that would be mainly cost driven, rather than technology driven (*Riverkeeper* 2007, p. 49).⁷ The decision also quoted a 1981 Supreme Court case, *American Textile Manufacturers Institute, Inc. v. Donovan*, in which the Supreme Court said, "When Congress has intended that an agency engage in cost-benefit analysis, it has clearly indicated such intent on the face of the statute" (452 U.S. 510; also quoted in *River-*

keeper 2007, p. 23). The court noted that it was unclear whether EPA improperly compared costs and benefits and whether EPA determined that the costs of closed-cycle cooling could not be borne by the industry. This was one basis for the Second Circuit sending the rule back to EPA. The Second Circuit also remanded the cost-benefit compliance alternative on the grounds that EPA exceeded its authority under the CWA in balancing costs and benefits.⁸

The Second Circuit decision was seen as a significant victory for environmental groups and a significant loss for industry; by having the rule remanded, EPA technically lost the case, although there were certainly some counterarguments for which government prevailed.

As part of its arguments, industry suggested that restoration was an integral component to the rule, and by having both restoration and the cost-benefit compliance alternatives removed, industry thought it lost key flexibilities in the rule, and was thus motivated to appeal the decision. Appealing a federal appeals court decision is to ask the Supreme Court to take up the case. Industry petitioned the Supreme Court, and was initially opposed by environmental stakeholders and the U.S. government. (The U.S. government position at that point was that the Agency was already working on a new version of the rule and that that effort ought to be allowed to play out to its conclusion, and also—in a cost-benefit balancing kind of way—that the legal question posed to the Supreme Court was not paramount among the many legal questions that might be posed to the Court, according to the Solicitor General, who represents the U.S. government before the Supreme Court.)

U.S. Supreme Court Case

On April 14, 2008, the Supreme Court granted the petition to hear the case (four judges must vote to accept a case), and though industry petitioners raised several questions, the Supreme Court granted a hearing on one and only one question: "whether Section 316(b) of the Clean Water Act ... authorizes the EPA to compare costs

⁷ Why would EPA have *conducted* a cost-benefit analysis if it was unclear that the statute allowed EPA to do so as part of its decision making? The simple answer is that Executive Order 12866 requires a cost-benefit analysis for any rule "having an annual impact on the economy of \$100 million or more," a threshold passed by even the least stringent of the regulatory options—other than no regulation at all—for this industry. The legal question was whether *decision making* could be based on cost-benefit analysis.

⁸ There were other grounds for remanding the rule to EPA; however, these were legal grounds not pertaining to cost-benefit analysis, and are not discussed here.

with benefits in determining the ‘best technology available for minimizing adverse environmental impact’ at cooling water intake structures.” (This meant the Supreme Court judged all other matters, including restoration, to have been settled by the Second Circuit decision.) Again, the procedure is for petitioners to prepare their briefs, for respondents to prepare theirs with access to the former, and for petitioners to file a reply brief. In the case before the Supreme Court, the petitioners were industry, although once the Supreme Court decided to hear the case, the U.S. government decided to join with industry in opposing the Second Circuit determination that cost-benefit was not allowed under §316(b) of the CWA; environmental stakeholders, affirming the Second Circuit decision, became the respondents. Briefs were filed, and oral arguments were held on December 2, 2008.

Any academic who has ever been told “I wish I had your job” after being asked how many hours a week he or she teaches will appreciate the following: the Supreme Court hears oral arguments from early October through the end of May, for two hours beginning at 10am on Mondays, Tuesdays, and Wednesdays, but only during the first two weeks of each month. Fridays are reserved for conference day, which is a meeting of only the Justices, where the votes are taken on cases heard that week, and writing assignments are made for majority and dissenting opinions. Although the Court has been criticized for not accepting more cases, it’s nonetheless well understood that the Justices’ work goes well beyond oral arguments.

In the truest meaning of the word, the Supreme Court is an awesome place. The courtroom has 250 seats, some of which may be reserved in advance through the clerk of the court, while the rest are available to the public on a first-come, first-served basis beginning at 7:30 am; for high profile cases, sidewalk camping increases one’s odds of getting in. You go through two metal detectors to enter the courtroom. No electronic equipment is allowed, though paper for note-taking is. Transcripts of oral argument will appear on the website later in the day (Alderson Reporting Company 2008). Dress must be appropriate. You are not allowed to slump in your seat. You are not allowed to wear glasses on top of your head. The courtroom begins to fill shortly after 9am. Clerks place paperwork at the Justices’ seats. In all, 24

briefs had been filed in this case: 7 by petitioners and respondents, and 17 as friend of the court briefs; all the briefs for this case have a beige cover to distinguish them from those of other cases. The press sits off to the Justices’ right. Nina Totenberg does a story on National Public Radio that morning about the case (Totenberg 2008). The Justices will sit in a row at the front, at a raised bench. At 10am sharp, the red curtains behind the bench part and the Justices enter, with the Chief Justice sitting in the middle, and the others on alternating sides from the center in order of decreasing seniority. The first order of business is the reading of a decision (not the full opinion) rendered that day and the swearing in of new attorneys to the Supreme Court bar. Then it’s on to oral argument, with the government starting the case, to be followed by industry, and then environmental petitioners.

The deputy solicitor general starts off by saying he has three reasons why the Appeals Court was wrong in its application of the Chevron test to this case. The first reason is EPA’s thirty years of experience considering costs in relation to benefits in permitting decisions.⁹ The deputy solicitor general is fairly succinct but only gets to reason number two before he is interrupted with the first question from the bench. Justice Souter questions whether cost-benefit can be especially applied at the level of a facility, and doesn’t know how to judge whether a thousand plankton are worth \$1 million (Alderson Reporting Company 2008, p. 7). Justice Ginsberg suggests that all agree it’s permissible to consider cost. These two justices seem to be striving for an answer to the question, “how can the benefits of saving eggs and larvae be estimated?”

But before long, the oral arguments take on an Alice in Wonderland like quality to the ear of a trained economist. Justice Roberts applies the best-technology-available argument to televisions and concludes that the TV that most passes the cost-benefit test doesn’t do so because it’s cheap but because it’s the fanciest TV. A comparison of §316b with another part of the CWA causes the focus to turn to the word “best” as justifying cost-benefit analysis. The question then turns to whether “minimize” means reduce to the greatest extent

⁹ See *Seacoast Anti-Pollution League v. Costle*, a 1979 First Circuit Court of Appeals case upholding the Administrator’s decision in a permitting case not to require additional investment whose costs would be “wholly disproportionate to any environmental benefit.”

possible or simply to reduce (and what does “reduce” mean?). The meaning of “reasonable” is then introduced.¹⁰

On to the industry attorney, who suggests that this is a Chevron step-one case, and that the first step is to decide that the statute does not unambiguously foreclose cost-benefit analysis. And now Justice Breyer wonders what “practical” means, and suggests that Congress was saying “you can’t avoid taking into account costs, but don’t do it too much” (Alderson Reporting Company 2008, pp. 20–21). There’s a bit of discussion about EPA’s thirty years of experience taking costs and benefits into account in terms of the wholly disproportionate test, though Justice Breyer describes it as a grossly disproportionate test, throwing the industry attorney somewhat off balance. Justice Kennedy asks the industry attorney if it would be possible for EPA to require closed-cycle cooling under the statute. The industry attorney says no, at which point Justice Kennedy suggests that the attorney no longer thinks this is a Chevron case.

Now it’s the environmental attorney’s turn, and he begins by suggesting that the Agency has been overstepping the bounds of the CWA for thirty years in applying the wholly disproportionate test, but immediately suggests that the plain meaning of the statute is that there is no possibility under EPA’s regulation that a regulated facility could have to spend millions of dollars to save just a few fish, which turns on the meaning of the word “availability.” Justice Alito likens this to reading the classifieds and finding a house for sale for \$50 million and calling that “available” (Alderson Reporting Company 2008, p. 31), even though to most of us, including Supreme Court Justices, it’s clearly not affordable.

At one point, Justice Alito suggested that if the environmental stakeholders were correct, then even costs could not be taken into account. And if costs can be taken into account, as everyone seemed to have agreed to thus far, then the case is really about Chevron step two (was EPA’s interpretation reasonable?), not step one (is the statute unambiguous?). Justice Souter asked if the question is only whether there is money in the bank to pay for the improvements, not whether the money in the bank is worth what they’re going to get for it. Justice Breyer and the environmental attorney

agreed to Senator Muskie’s notion [Alderson Reporting Company (2008, p. 43), citing the legislative history] that allowing a cost-benefit comparison would result in systematic underregulation that sounded quite reasonable (see above on theoretical vs. practical application of the cost-benefit compliance alternative). But then the environmental attorney could not articulate the checks on EPA’s analysis, except to say that Congress understood that information was not costless, and that by not allowing EPA to make decisions on the basis of cost-benefit would in effect afford a better cost-benefit outcome, because the Agency wouldn’t be paralyzed by imponderables and the rule would be based on “less information rather than more information” (Alderson Reporting Company 2008, p. 52) (a difficult proposition for many environmental economists). Justice Souter recognized that not allowing cost-benefit analysis would in effect mean that the analysis would be conducted *sub rosa*. Chief Justice Roberts quizzed the environmental attorney as to whether the Second Circuit’s decision didn’t in fact overturn the same court’s decision in the Phase I case, where it was held that it is permissible for EPA to reject dry cooling because it was too expensive for saving such a small number of additional organisms, a cost-benefit argument to be sure (*ibid.*, p. 58).

On April 1, 2009, the Supreme Court issued its decision (*Enterger Corp. v. Riverkeeper, Inc., et al.*), deciding 6 to 3 that the EPA has the authority to use cost-benefit comparisons in §316(b) regulations. Justice Scalia wrote the majority opinion, joined by four others. Justice Breyer wrote an opinion concurring in part and dissenting in part, while Justices Ginsburg and Souter joined the dissenting opinion written by Justice Stevens.

The majority opinion reminds us that if the statute is ambiguous, then the Chevron test requires courts to ask if an agency’s interpretation of the statute is a reasonable one, and not whether it is the only possible interpretation or even the most reasonable one using a court’s judgment. By noting that where Congress intended to have a particular impact (such as the eventual elimination of pollution discharges), and looking to other places in the CWA for language, Congress tended to say so clearly. The Supreme Court also articulated that even if all agree that the statute does not require EPA to consider cost-benefit analysis, this does not mean that EPA is not

¹⁰ The words most commonly used in the transcript (including variants) in order of appearance are: *available, meaning, best, reasonable, minimize, and reduce.*

permitted to do so.¹¹ The Justices also noted that there has been 30 years' time during which the Agency has implemented a variant of cost-benefit balancing (the test of whether costs are wholly out of proportion to benefits in permitting), and while not determinative, this certainly suggests the reasonableness of this interpretation of the statute. And finally the Justices noted that even respondents and the Second Circuit admitted that limited cost-benefit balancing was an appropriate interpretation of the statute, thus conceding the main point of the case. Hence, the Supreme Court overturned the lower court's decision, remanding the case for further proceeding consistent with the Supreme Court decision.

Justice Breyer's separate opinion confirms that he agrees with the majority that a cost-benefit comparison is permissible, although he suggests that the text of the law is somewhat restricting. He thinks that the sponsors feared that cost-benefit analysis would emphasize easily quantifiable factors over more qualitative factors, in particular the value of preserving nonmarketable species of fish. He supports the use of a wholly disproportionate test. However, in the Phase II rule, EPA changed the wording from the historical usage of "wholly disproportionate" to "significantly greater than," without adequate justification for the switch.

The main point of Justice Stevens' opinion for the dissenting group is that while the CWA neither explicitly prohibits nor explicitly authorizes a cost-benefit comparison, it nonetheless suggests that if a technology is available and performs better than other available technologies ("available" allows taking costs into consideration), then it must be deemed BTA under the statute. And that because other portions of the CWA explicitly suggest whether costs and benefits are to be compared, the silence in this portion of the statute is determinative, because Congress has not delegated to the Agency the authority to make a cost-benefit comparison. Another way to say this—articulated by many in the environmental community and not simply in relation to this case—is that Congress had already undertaken the most basic cost-benefit calculus when deciding to include a technology-based paragraph in §316(b) of the statute (see Alderson Reporting Company

2008, p. 40; *Riverkeeper* 2007, p. 49; and Kysar 2009), and therefore did not delegate to the Agency the authority to base regulatory decision making on cost-benefit grounds.

Where are things now? In principle, the Second Circuit must revise its decision in light of the Supreme Court decision. However, EPA was already in the process of developing a new rule, and can continue doing so while taking the Supreme Court's decision into account, since the decision places no additional limitations or requirements on the Agency. EPA cannot simply reinstate the original Phase II rule, because there were issues besides the cost-benefit comparison in the Second Circuit's decision that were remanded to the Agency, and the Supreme Court decision did not affect those other issues.

The Denouement

Friend of the Court Briefs

Earlier I noted that there were 17 friend of the court briefs filed in this case. Two of these were submitted by groups of economists—one in support of petitioners, and the other in support of respondents. First, the brief supporting the use of cost-benefit analysis (Arrow et al. 2008); this brief was filed by 33 economists, including three Nobel Prize winners, several former members of the President's Council of Economic Advisers, and many well-published environmental economists. I knew I had spent a lot of time working with attorneys and reading legal briefs when upon reading this one, I found it unpersuasive, despite agreeing with nearly everything it said. It was unpersuasive because it did not directly address the legal question before the Supreme Court [indeed, as much as said so (Arrow et al. 2008, p. 3)], but rather whether the statute *should* have given EPA the authority to consider costs and benefits, and not just in the portion of the statute at issue, but in the CWA as a whole as well as other environmental statutes. That is not a question the Supreme Court would ever answer, the Constitution clearly having granted to Congress and only to Congress the power to make laws. Their message would have been better directed at Congress than at the Supreme Court.

These economists deemed the Second Circuit's opinion economically unsound, concluding that regulators need to consider costs and benefits in

¹¹ Also in the majority opinion (*Entergy* 2009, p. 13), the Supreme Court allowed that there might be arguments against "a rigorous form of cost-benefit analysis" but noted that this was not the legal question posed to it.

order to make rational decisions, and to do so in a transparent fashion. These economists were not arguing that cost-benefit analysis ought to be the only decision making rationale, and noted the great difficulties associated with comparing quantitative and qualitative information. Perhaps the most intriguing portion of their brief is their quotation of a letter written by Benjamin Franklin, describing a method for making private decisions that he called a “Moral or Prudential Algebra.” This essentially involved listing the pros and cons of a certain decision, giving appropriate weights to each factor, and then determining their balance. Franklin advises this approach for improving rationality, because difficult cases become difficult due to the challenge of keeping all the relevant factors in mind at one time. Formal cost-benefit analysis as we know it today is clearly one form of Franklin’s moral algebra. Rare, however, is the modern example where qualitative factors are also formally listed in cost-benefit analysis.

The second brief has fewer signatories, but nonetheless includes many well-published authors, names recognizable to those who follow the ecological economics literature. Like the dissenting opinion on the Supreme Court, this group takes the position that Congress had already conducted the only cost-benefit calculus necessary in compelling EPA to issue technology-based regulations for cooling water intake structures [“the benefits of cooling water intake regulation are sufficiently vast and difficult to quantify that only the ‘best’ control technology will suffice” (Ackerman et al. 2008, p. 37)]. That EPA was to determine whether the best technology was also economically available is viewed in this brief as a check on the Agency, principally to address distributional considerations, such as numerous plant shutdowns. These economists remind us that cost-benefit analysis can shed light on the allocative efficiency of a program, but only in a Kaldor-Hicks sense rather than a Pareto-optimal fashion.¹² Also, basing benefits estimation on a will-

ingness-to-pay (WTP) approach means that the results are contingent on the underlying distribution of wealth from which the WTP valuations are deduced. They cite Amartya Sen by way of criticizing the stated preference approach to monetization (and would prefer a cost-effectiveness analysis instead). Finally, they suggest that cost-benefit, while promoting rational decision making, is not so integral to the Constitution as to be read into all of our statutes.

These economists also point out that a cost-benefit analysis does not determine whether a technology is economically available—that determination comes from conducting a financial analysis of whether the firm has the cash flow to cover the annualized expenses associated with technology, or not (in which case the facility would likely shut down), and aggregating over firms. They present two examples in support of this argument: an economically efficient technology (benefits exceed the costs) that is not economically available (firms do not have cash flow to cover annualized costs of technology, and can’t stay in business), and an economically available technology that is not economically efficient (the technology is available, but a cost-benefit analysis would suggest against its adoption). Finally, these economists argue that EPA’s cost-benefit analysis was flawed by not including non-use value, or indeed any value for 98.2 percent of the lost age-1 equivalents of all species. This brief was more compelling in terms of addressing the actual legal question at issue.

Others Who Have Opined

In a recent “Resources for the Future” volume on better regulatory review, Farrow (2009) reiterated a point made by the NOAA¹³ panel on contingent valuation about following the faint behavioral trails, instead of attempting to monetize non-use benefits. Unfortunately, as Farrow points out (p. 183), even the faint behavioral trails that have revealed themselves in this instance—manatee viewing and recreational fishing near the warm water outfalls associated with once-through cooling—would not necessarily be uniformly viewed as beneficial. Assuming these faint behavioral trails are associated with environmental benefits

¹² The Kaldor-Hicks criterion states that if benefits of a policy exceed costs of a policy, then it is possible for the winners to compensate the losers, leaving everyone better off. Note that the possibility of compensation, and not the actual compensation, is all that is required for a policy to be Kaldor-Hicks-efficient. The Pareto criterion, on the other hand, suggests that a policy will improve social welfare (and should be undertaken) if it makes no one worse off, and makes at least one person better off. All Pareto-efficient programs would be Kaldor-Hicks-efficient, but the converse is not true.

¹³ National Oceanic and Atmospheric Administration.

favors the protection of recreational species (in many cases, nonnative species) and easy access to endangered species over forage fish and the natural functioning of aquatic ecosystems. Indeed, Kysar (2009) notes a general dissatisfaction with the assumption that “natural and human-made capital are generally substitutable” (pp. 201–202) that is central to neoclassical environmental economics approaches to cost-benefit analysis.

A Common Denominator Between the Second Circuit and the Supreme Court

The Second Circuit case was heard by a three-judge panel, but the decision was written by Judge Sonia Sotomayor. She recently replaced Justice Souter on the Supreme Court. While this is a decision she wrote that was subsequently overturned by the Supreme Court, it should be noted that this has happened to every circuit court of appeals judge elevated to the Supreme Court. She was also the judge who engaged in the most vigorous questioning during oral arguments in the Second Circuit.

Having Attorneys and Judges Who Really Understand Economics

On the day of oral arguments at the Supreme Court, I ran into an economist I know from our overlapping days in graduate school. She was there with her law school class, now being a student at a local law school—her professor just happened to have picked a day for which she would be able to follow the arguments even without reading any briefs. This is noteworthy because she is on a scholarship in a program aimed specifically at attracting Ph.D. economists to law school, in an effort to expand the ranks of professional lawyers who understand economics not just at the undergraduate level, but at the postgraduate level, where the true complexities of economics are studied.

The Chevron Test Redux

In this closing section, I express my dismay that the legal question of authority to compare costs and benefits rests on only two possible states of the world in the first part of the Chevron test. The

two states of the world in the Chevron step-one test are that Congress was either unambiguous or not as regards intent, with ambiguity seen as delegating decision making to the agency. But this approach still very much leaves open to interpretation the question of silence in regards to cost-benefit, as is obvious with the dramatically differing interpretations brought by the government and industry, and environmental groups. Each, heard individually, makes sense and is plausible on its face, which is hardly determinative (Morganstern 1997, pp. 15–16). Yet, the court was forced to choose; this court made a choice that most would have predicted; a different court could easily arrive at a different decision. This isn’t a particularly satisfying result to accept, not for economists anyway, though perhaps acceptable to attorneys who are trained to think in such terms.

There is a more plausible description of the relevant states of the world. The relevant states of the world are that Congress prohibits cost-benefit considerations in decision making, Congress explicitly requires cost-benefit comparisons, and Congress is silent in regards to cost-benefit.¹⁴ Through a review of environmental statutes for examples of the two former cases, it will perhaps become more apparent what silence may truly imply. Even the Supreme Court in its articulation of the Chevron two-step test—perhaps because it, too, was a case involving interpretation of an environmental statute—starts with the unambiguous case, and then describes its opposite using the phrase “silent or ambiguous,” making no further distinction between a permissible construction from ambiguity and a permissible construction from silence.

The 1994 Congressional elections saw the House of Representatives switch from a Democratic majority to a Republican majority for the first time in 40 years, due in part to the Republican Party’s national election effort known as the Contract with America. Two ideas contained in the Contract with America that were in legislation not enacted were to impose on regulatory agencies a requirement to conduct a cost-benefit analysis for major rulemakings, and to have such

¹⁴ Prohibiting cost-benefit analysis need not be explicit; it can take the form of listing a set of allowable factors in agency decision making, where that list neither contains cost-benefit analysis, nor contains anything that could be construed as containing cost-benefit analysis.

analyses reviewed by the Office of Management and Budget (both codifying parts of Executive Order 12866).¹⁵ At the time, there were also calls for legislation to contain a prohibition on regulations for which benefits were exceeded by costs. These proposals spurred at least two efforts to describe the current legal status of conducting cost-benefit analysis by taking a broad look across all the environmental statutes that EPA is charged with implementing. See Schierow (1994) and Morganstern (1997) for more details, although I will briefly summarize the findings of both authors here.

Schierow (1994) was more focused on whether the consideration of costs was statutorily authorized, rather than the larger question of whether cost-benefit analysis was authorized; however, she cataloged statutes according to both. She noted also that:

Although generally characterized as a scientific activity, risk analysis is not, and probably can never be, entirely objective or fact-based. Risk analysis was developed to evaluate what is known about things that cannot be known with certainty. ... Because these choices cannot be based on science alone, they are subject to challenge.

She found that most environmental statutes allowed or even required the analysis of risk, and that many allowed or required the consideration of costs as well, although examples of both could be found, even within the same statute. For instance, the Clean Air Act (CAA) requires the National Ambient Air Quality Standards (NAAQS) to be set on the sole basis of risk to human health—that is, the NAAQS represent the lofty and aspirational goals of the CAA—while the various emission standards sections of the CAA for hazardous air pollutants and vehicle emissions allow consideration of both risk and costs—that is, the implementing standards EPA determines to guide the nation to achieving its lofty and aspirational goals. The CWA has a similar construction between the §101(a) national goals and §303 water quality criteria—the lofty and aspirational goals—and water quality standards and effluent guidelines limita-

tions—two implementing programs in which costs may also be explicitly considered.

Though perhaps somewhat less numerous than the explicit prohibition cases where even costs cannot be taken into account, there are likewise examples where Congress has explicitly compelled EPA to conduct cost-benefit analysis. Section 812 of the CAA requires EPA to publish a report enumerating the costs and benefits of the entire CAA program; the first report was a retrospective report, while subsequent reports were to take a prospective look at the CAA programs' costs and benefits (U.S. EPA 1997, 1999).

The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) requires the Agency to register only those pesticides “without unreasonable adverse effects on the environment,” while “taking into account the economic, social, and environmental costs and benefits of the use of any pesticide.” Note however that while FIFRA is considered a cost-benefit statute, the benefit of a pesticide is generally understood to be its effectiveness relative to substituted pesticides that would be used if the particular pesticide were not approved for registration.

The Toxic Substances Control Act (TSCA) allows the EPA to consider “a comparison of the estimated costs of complying ... and the relative efficiency ... to protect against such risk of injury” in §6 regulations of chemicals, although parts of TSCA are self-implementing and there are few regulations issued under TSCA relative to other environmental statutes, limiting the effectiveness of the cost-benefit provision. Key provisions have been added to TSCA over the years to cover asbestos, indoor radon, and lead-based paint regulations, where the first and last of these focused specifically on the health of children or school-aged children.

As Morganstern (1997, p. 8) notes, several statutes require that “costs must be reasonable,” but that courts have held that a formal cost-benefit analysis is not required to meet that standard. Table 1 in Morganstern (1997, p. 9) summarizes his review of statutes. His general conclusion was that “Various statutes forbid, inhibit, tolerate, allow, invite or require the use of economic analysis in environmental decisionmaking” (p. 20).

The Safe Drinking Water Act (SDWA) was last amended in 1996 (subsequent to Schierow's 1994 review), and the amendments required EPA on is-

¹⁵ Two successful pieces of legislation that passed under the Contract with America that affect EPA's analysis of regulations today were the Small Business Regulatory Enforcement Fairness Act of 1996 (making judicially reviewable the Agency's conduct of requirements under the Regulatory Flexibility Act of 1980) and the Unfunded Mandates Reform Act of 1995.

suings or revising any National Primary Drinking Water Regulations (NPDWR), and the maximum contaminant levels (MCLs) that are the primary regulatory tool in NPDWRs, to conduct a cost-benefit analysis and to determine whether the benefits justify the costs; this is generally understood to not require that monetized benefits exceed costs.

More recently, the Center for Progressive Reform (CPR) conducted a comprehensive review of health, safety, and environmental statutes in regards to the degree to which agencies may consider costs or costs and benefits in issuing implementing regulations in developing recommendations related to President Obama's call for comments on an executive order to revise E.O. 12866 (CPR 2009). They classify statute sections into five distinct categories and one hybrid: technology-based, effects-based, phased bans, multi-factor balancing, cost-benefit, and technology-based/cost-benefit hybrid (see their table, "Only Two Statutory Provisions Protecting Health, Safety, and the Environment Call for Cost-Benefit Analysis"). They note that Congress generally anticipated that costs would be considered in technology-based statutes [CWA and CAA feature prominently, with the Resource Conservation and Recovery Act (RCRA) also among the environmental statutes listed], while costs are often forbidden from being taken into account with effects-based statutes (also CWA and CAA and Endangered Species Act).¹⁶ Phased bans are seen as a special case of effects-based statutes where Congress recognized that much higher costs are a consequence of an immediate ban, hence the phasing (CAA and TSCA). Multi-factor balancing statutes often list both costs and benefits as factors, along with others that must be considered, such that a strict cost-benefit balancing is unlikely to be determinative [Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), FIFRA, and TSCA]. SDWA is the only statute CPR lists in the technology-based/cost-benefit hybrid category (EPA may use a cost-benefit rationale in deviating from technology-based standards). And finally, only non-environmental statutes are included in their cost-benefit category: the Consumer Product Safety Act,

and the Accountable Pipeline Safety and Partnership Act.

To summarize this review, notice that the explicit requirements to undertake cost-benefit analysis are all associated with statutes that are *largely* aimed at protecting human health: CAA new source standards, CAA §812 reports, SDWA MCLs, TSCA chemicals, and FIFRA pesticide registrations. Based on these existing reviews of environmental statutes, I have found no examples where the main objective of the statute is to protect ecosystems rather than human health, and where cost-benefit analysis is either required or even explicitly permitted.

The Supreme Court articulated the Chevron test used in this case in the first place, and they are presumably free to revise the test according to sound judicial principles and the Constitution. What would a revised test look like? Despite my lack of legal training, I offer one possibility, which is a three-part test. The first part remains the same: "is the statute unambiguous?" This part remains consistent with the lower courts' predilection to use plain language constructions. The second part represents the critical diversion from the original Chevron test, and is a new step to be inserted. In the second step, the court would ask, "is there a pattern or trend to be gleaned from the class of statutes to which the statute at issue in the current proceedings belongs that would guide interpretation of the ambiguous language?" This step takes into account the coherence of Congress's intent as expressed over time (e.g., SDWA and its amendments) or over the span of a class of statutes (e.g., environmental law in general). This coherence of Congress may not be clearly or explicitly articulated—and I mean purposefully so, rather than through neglect—in a specific statute. This step is somewhat akin to taking the legislative history into account when determining the reasonableness of an interpretation relative to Congress's intent; EPA usually looks to the legislative history for guidance whenever a statute is open to interpretation, although the legislative history does not legally constrain Agency actions. Inserting this step is a warranted recognition of the inherent difficulty of addressing issues for which consensus is difficult—ultimately, Congress leaves out the parts that can't be agreed upon, and includes the parts that can be agreed upon in language. Also, this step recognizes that smaller units write specific regulations called for

¹⁶ Morganstern (1997) and CPR (2009) differ on whether cost-benefit reasons are allowed in setting Clean Air Act standards for new sources.

in a section or sections of a statute, while a larger agency is (or multiple agencies are) generally responsible for carrying out the suite of programs anticipated by a statute. It is at the agency level that more attention is paid to making sure that the individual regulations are consistent with broader policy goals, including trends in statutes or statutory interpretation.

The final step in this modified Chevron test is a slight variant on the original: “if the answer to step two is no, the question is whether the Agency’s interpretation is reasonable, while if the answer to step two is yes, the question becomes whether the Agency’s interpretation is reasonable in light of the gleaned pattern or trend.” This test is workable, because once articulated, it would be a relatively straightforward determination as to how well the parties to a judicial proceeding addressed these questions. Indeed, Agencies could build an administrative record to demonstrate the degree to which they believe deference should be granted.

How would application of this modified Chevron test be applied in *Cooling Water v. Fish*? The same result would obtain in step one: the statute is ambiguous by virtue of its silence. Environmental stakeholders, a party disagreeing with the outcome of the Supreme Court decision, could agree with this characterization, because their true concern is really the result of step two of the modified Chevron test. In step two, stakeholders would be free to discern their own patterns, and there is no guarantee that the pattern I discerned above would be the prevailing one. The important aspect of this step is that it forces stakeholders engaged in an adversarial process to articulate the patterns or trends, rather than depend on agencies in the course of their work (outside an adversarial process) to divine interpretations from the vague language of one statute. This would also invite stakeholders to go beyond the inevitable comparison of Congress’s work to sausage-making. Step three retains the useful and important function of serving as a check against arbitrary and capricious behavior on the part of agencies.

A plausible interpretation of the silence in CWA §316(b) on cost-benefit is that it is simply a reflection—taken over the period in which environmental statutes have been enacted—of a general recognition that there is more readily available data as well as consensus on valuation methods when valuing improvements to human health

than in ecosystems. The recent EPA Science Advisory Board’s Committee on Valuing the Protection of Ecological Systems and Services (CVPSS) report (Science Advisory Board 2009) focused on improving the practice of ecosystem valuation. While the courts may argue that silence means that Congress has effectively delegated to the Agency the authority to interpret statutes to determine whether cost-benefit analysis can be used in regulatory decision making, the Agency is in a weaker position in regards to ecosystem benefits than human health benefits. A stronger legal test would shine a light directly on the need to improve ecosystem valuation.

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