

TESTIMONY

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The Performance of Clean Water Act Monitoring and Enforcement

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Testimony

Mr. Chairman and distinguished members of the committee, thank you for the invitation to testify on the subject of the Clean Water Act after 37 years. My name is Jay Shimshack, and I have been conducting research on Clean Water Act (CWA) enforcement and compliance for more than a decade. I have also investigated broader issues of environmental monitoring and enforcement under contract for the US Environmental Protection Agency (EPA) over the past several years. I am currently Assistant Professor of Economics at Tulane University and Visiting Scholar at the Erb Institute at the University of Michigan. The views expressed today are my own.

Since my expertise lies primarily in regulatory oversight, I will focus today's discussion on understanding and strengthening the performance of CWA *monitoring and enforcement*. First, I will provide some context. Second, I will summarize the state of knowledge on the effectiveness of CWA enforcement. Third, I will review the consequences for improved water quality management.¹

Status and Trends

To understand the issues, it is useful to provide some context. Broadly characterizing CWA performance is challenging. I recently compared several commonly used metrics for assessing CWA compliance (Shimshack 2009). I chose a single industry and a single time period to compare 'apples to apples.' A key conclusion was that different performance measures yielded significantly different results. For example, a comprehensive metric that included reporting, scheduling, and all possible effluent violations showed that nearly half of sample facilities were noncompliant. However, a pollutant-specific metric showed that only two percent of sample facilities were actually exceeding monthly limits for the industry's most common pollutant. Monthly average discharges of this pollutant were less than 40 percent of allowable levels. In other words, some reasonable metrics suggested good environmental performance while other reasonable metrics simultaneously suggested poor environmental performance.²

Regardless of how one defines noncompliance, however, the evidence suggests that enforcement actions under the CWA are infrequent relative to the number of violations. Many violations are not sanctioned. Formal enforcement actions with monetary fines are especially rare, and dollar amounts are modest relative to those allowable under the law. Maximum CWA administrative penalties are up to \$50,000 per day. Between 2001 and 2008, the median amount of actually levied EPA CWA penalties was \$3,000,³ and these penalties often targeted multiple violations spanning many months.

Environmental monitoring and enforcement are, on average, falling over time. I am unable to find a consistently reliable and comprehensive time series of enforcement budget statistics

¹ This brief testimony draws extensively from my former work in the area, and more complete discussions of all points can be found in Shimshack 2007 and Gray and Shimshack 2009.

² Vastly different conclusions from different metrics may explain why some authors note high rates of CWA compliance while others note low rates of CWA compliance.

³ This summary statistic is based on the author's calculations on data extracted from the EPA ECHO database.

specific to the CWA. However, overall EPA enforcement budgets declined by about a third in the late 1990s and still remain approximately 20 percent below peak levels in real terms. EPA civil and criminal referrals to the Department of Justice have trended downward over the past decade, and agency inspections and formal administrative actions have declined especially in recent years.

The Relationship between CWA Enforcement and Compliance

While CWA enforcement actions are infrequent and declining, an academic and policy literature shows that they are effective. Results from qualitative facility surveys indicate that enforced regulations have historically been, and remain, more important determinants of environmental behavior than any other factor. Government actions are frequently ranked as the single most important source of deterrence pressure (Khanna and Anton 2002, May 2005, Delmas and Toeffel 2008).

Further, a quantitative database analysis literature shows that CWA monitoring and enforcement activities generate substantial specific deterrence, meaning that inspections and sanctions consistently reduce future violations at the evaluated or sanctioned facility (Magat and Viscusi 1990, Earnhart 2004a, Earnhart 2004b, Glicksman and Earnhart 2007). CWA enforcement activities also generate substantial general deterrence, meaning that sanctions spillover to deter violations at facilities beyond the sanctioned entity (Shimshack and Ward 2005). The essential intuition is that sanctions enhance the regulator's reputation for toughness.⁴

Measured deterrence impacts are typically large. One specific CWA deterrence study found that a facility's odds of noncompliance were about twice as great if they had not been inspected in the previous quarter (Magat and Viscusi 1990). A CWA general deterrence study found that an additional fine induced about a two-thirds reduction in the state-industry water pollution violation rate for the year following the fine (Shimshack and Ward 2005). Evidence suggests that enforcement severity also matters; larger fines induce greater changes in compliance and fines deter more violations than non-monetary sanctions.

The quantitative evidence suggests that enforcement actions not only affect compliance decisions, but discharges as well. When inspections and fines reduce violations, pollution is of course reduced. However, fines and inspections also encourage *beyond compliance* behavior (Shimshack and Ward 2008). Studies indicate that plants with discharges typically below legally permitted levels reduce discharges further when regulators issue fines, even on other facilities. In addition, likely non-compliant plants often respond to increased regulatory threats by reducing discharges beyond reductions required to meet statutory requirements.⁵ It follows that

⁴ Other authors find similarly strong specific and general deterrence effects for enforcement actions levied under other domestic environmental statutes. See, for example, Gray and Deily 1996, Nadeau 1997, Stafford 2002, Gray and Shadbegian 2005, and Keohane et al. 2009.

⁵ Beyond compliance behavior can be rationalized by economic theories involving discharge randomness and jointness in pollution production (Bandyopadhyay and Horowitz 2006, Shimshack and Ward 2008). Plants with partially random discharges may face some possibility of a sanction from accidental releases, so they may reduce discharges even further beyond compliance when the regulatory threat increases. When pollutants are jointly produced, a plant may reduce a pollutant with a binding limit when the regulatory threat increases and correspondingly push the jointly determined pollutant even further beyond compliance.

enforcement activities may generate significant effluent reductions even for sectors and contaminants where compliance is typically high.

While the literature convincingly demonstrates that CWA monitoring and enforcement actions enhance environmental performance, deterrence effects do not last indefinitely and deterrence effects do not reach across all regulated facilities. Regulated entities regularly update their beliefs about regulatory stringency, and enforcement deterrence effects decay rapidly (Magat and Viscusi 1990; Shimshack and Ward 2005). Also, the reach of the regulator reputation effect underlying general deterrence is limited by jurisdictional boundaries (Gray and Shadbegian 2007). Fines in Georgia may affect compliance behavior in that state but may have little impact on facilities in Florida. Consequently, regulators must maintain a constant monitoring and enforcement presence to induce consistent environmental performance over time and across space.

Implications

In my professional judgment, several implications follow from the state of knowledge summarized above:

- A substantial improvement in environmental performance may be achieved with a modest additional investment in traditional monitoring and enforcement activity.

CWA enforcement actions significantly deter subsequent violations at the sanctioned facility, reduce violations at other facilities in the same jurisdiction, and encourage greater pollution reductions at plants that are already in compliance. In other words, fines and inspections have significant impacts on water pollution outcomes.

The evidence on the strength and speed of the average pollution response to *modest* and *infrequent* sanctions also suggests that facilities' incremental CWA compliance costs are likely low, at least for well studied large industrial facilities. CWA penalties are infrequent and relatively small, yet minor changes in the likelihood and size of sanctions induce large and rapid behavioral changes. Fast pollution reductions imply that plants may invest more care towards maintenance, spill avoidance, operational efficiency, employee effort, and training in periods of high perceived regulatory stringency. These activities do not rely on large capital expenditures such as those required by new equipment installations. If current pollution limits are not overly stringent, enforcement induced pollution reductions may translate into large social welfare gains.

- A substantial improvement in environmental performance may be achieved with a modest additional invest in enforcement stringency.

Fines provoke significant specific deterrence, general deterrence, and beyond compliance pollution reductions. Larger fines generate greater compliance and pollution effects. In contrast, the evidence for deterrence effects from common informal CWA enforcement actions like telephone calls and notices of violation is mixed. A reallocation of enforcement resources away from discretionary informal actions towards more frequent

and more severe formal enforcement actions may result in substantial improvements in environmental performance.

- Sweeping departures from our current regulatory system may not be warranted.

Policy observers now advocate more frequently for voluntary, cooperative, informational, or alternative approaches to water pollution control. More research is needed, but the current state of knowledge does not support sweeping regulatory changes. The emerging literature exploring voluntary, informational, or cooperative programs finds mixed results (Khanna 2001, Lyon and Maxwell 2002). In contrast, the enforcement literature consistently finds that the deterrence effects from CWA inspections and sanctions are large. Enhancing environmental performance may simply entail greater and more nuanced use of current policy instruments.

- Environmental regulators should consider more vigorously publicizing their enforcement actions.

While the evidence suggests that information provision should not replace traditional enforcement, new incremental transparency policies may leverage current enforcement efforts to achieve greater impacts. Spillover deterrence effects of sanctions require that facilities know about monitoring and enforcement actions at other regulated entities. Current state and EPA enforcement alerts are infrequent and highly aggregated, so facilities may not be sufficiently informed of monitoring and enforcement activity directed towards other regulated entities in the industry. Therefore, state and EPA authorities should consider pilot programs that publicize sector-specific enforcement details.⁶

- Congress, EPA, and the states should facilitate research on environmental enforcement and compliance through improved data access and enhanced research funding.

The state of science on CWA enforcement and compliance has several key knowledge gaps. First, we don't fully understand the relative deterrence effects of different enforcement instruments in different contexts. For example, we don't often know the expected marginal benefits of an additional inspection versus an additional administrative fine versus an additional DOJ referral. Second, we don't completely understand how heterogeneous plant characteristics affect the strength of enforcement responses. We still have a lot to learn about what systematically drives deterrence at the facility-level. Third, we don't know if the common system of targeting predominantly 'bad apples' for enforcement achieves the greatest overall compliance bang for the buck. Finally, we don't know much about regulators' implementation costs for different monitoring and enforcement instruments. Consequently, understanding benefit-cost ratios for CWA interventions is difficult.

⁶ It is possible, although not probable, that facilities currently overestimate their perceived risk of sanction. Thus, the effects of these pilot programs should be carefully monitored.

Minimizing the above uncertainties, and many others, could importantly contribute to the state of knowledge. The amount and quality of external research conducted on CWA compliance, deterrence, and environmental performance would increase significantly if the EPA and the states expanded the availability of *historical* compliance and discharges data. Only a few years of data is typically available, even for technical users, and this is often insufficient for careful quantitative research. The amount and quality of external CWA research would also increase significantly if the EPA and the states expanded the availability of *complete* compliance and discharges datasets. Technical user access to complete datasets has become increasingly secretive, bureaucratic, and cumbersome. Finally, the amount and quality of CWA research would improve if Congress, the EPA, and the states funded more water quality investigations. Research funding in the area is rare, even relative to other environmental topic areas.

Summary

Comprehensively characterizing monitoring activity, enforcement effort, and compliance status under the CWA is sensitive to measurement approach. However, three stylized facts consistently emerge. First, enforcement activity is relatively rare compared to the number of violations. Second, fines tend to be modest relative to fines allowable under the law. Third, enforcement activity is declining in recent years.

Despite the relative scarcity, however, a growing literature shows that state and federal enforcement actions importantly influence environmental performance. CWA inspections and fines significantly deter subsequent violations at the sanctioned facility, reduce violations at other facilities in the same jurisdiction, and encourage greater pollution reductions at plants that are already in compliance.

Policy implications follow. First, significant improvements in environmental quality may be achieved with modest additional investments in inspections, sanctions, and especially fines. Second, Congress, the states, and EPA can improve environmental performance without dramatically altering CWA provisions or management. More enforcement resources and oversight may translate into substantial improvements in environmental quality; the potential impacts of more radical changes are poorly understood.

Thank you for the opportunity to testify on this important topic.

References

- S. Bandyopadhyay and J. Horowitz, Do Plants Overcomply with Water Pollution Regulations? The Role of Discharge Variability, *Topics in Econ. Analysis and Policy* 6, Art. 4 (2006).
- M. Delmas and Toffel, M. Organizational Responses to Environmental Demands: Opening the Black Box, *Strategic Management Journal*. 29: 1027-1055 (2008).
- D. Earnhart, Regulatory Factors Shaping Environmental Performance at Publicly-Owned Treatment Plants, *J. Environ. Econ. Manage.* 48, 655-681 (2004a).
- D. Earnhart, Panel Data Analysis of Regulatory Factors Shaping Environmental Performance, *Rev. Econ. Stat.* 86, 391-401 (2004b).
- R. Glicksman and D. Earnhart, The Comparative Effectiveness of Government Interventions on Environmental Performance in the Chemical Industry, *Stanford Env. Law J.* 26. 317-371 (2007).
- W. Gray and M. Deily, Compliance and Enforcement: Air Pollution Regulation in the U.S. Steel Industry, *J. Environ. Econ. Manage.* 31, 96-111 (1996).
- W. Gray and R. Shadbegian, When and Why do Plants Comply? Paper Mills in the 1980s, *Law and Policy*, 27, 238-261 (2005).
- W. Gray and R. Shadbegian, The Environmental Performance of Polluting Plants: A Spatial Analysis, *J. Regional Science*, 47, 63-84 (2007).
- W. Gray and J. Shimshack, The Effectiveness of Environmental Enforcement: An Empirical Economics Perspective, *Tulane University Working Paper* (2009).
- M. Khanna, Economic Analysis of Non-Mandatory Approaches to Environmental Protection. *Journal of Economic Surveys* 15(3): 291–324 (2001).
- M. Khanna and W. Anton, What is Driving Corporate Environmentalism: Opportunity or Threat? *Corporate Environmental Strategy* 9, 409-417 (2002).
- N. Keohane, E. Mansur, and A. Voynov, Averting Enforcement: Evidence from New Source Review, *Journal of Econ. Manage. Strategy* 18(1): 75-104 (2009).
- T. Lyon and J. Maxwell. Voluntary Approaches to Environmental Regulation: A Survey. In M. Frazini and A. Nicita (eds.), *Economic Institutions and Environmental Policy*. Aldershot and Hampshire: Ashgate Publishing (2002).
- W. Magat and W.K. Viscusi, Effectiveness of the EPA's Regulatory Enforcement: The Case of Industrial Effluent Standards, *J. Law Econ.* 33, 331-360 (1990).

- P. May, Regulation and Compliance Motivation: Examining Different Approaches, *Public Admin. Rev.* 65, 31-44 (2005).
- L. Nadeau, EPA Effectiveness at Reducing the Duration of Plant-Level Non-Compliance, *J. Environ. Econ. Manage.* 34, 54-78 (1997).
- J. Shimshack, Monitoring, Enforcement, and Environmental Compliance: Understanding Specific and General Deterrence, State-of-Science White Paper Prepared for the EPA's Office of Research and Development and Office of Enforcement and Compliance Assurance. 47 pp. (2007).
- J. Shimshack, Pilot Comparative Analysis of Monitoring and Enforcement Impact Measures" State-of-Science White Paper Prepared for the Environmental Protection Agency's Office of Enforcement and Compliance Assurance. 40pp. (2009)
- J. Shimshack and M.B. Ward, Regulator Reputation, Enforcement, and Environmental Compliance, *J. Environ. Econ. Manage.* 50, 519-540 (2005).
- J. Shimshack and M.B. Ward, Enforcement and Over-Compliance, *J. Environ. Econ. Manage.* 55(1): 90-105 (2008).
- S. Stafford, The Effect of Punishment on Firm Compliance with Hazardous Waste Regulations, *J. Environ. Econ. Manage.* 44, 290-308 (2002).

Biographical Sketch

Jay Shimshack is Assistant Professor of Economics at Tulane University and Visiting Scholar at the Erb Institute for sustainable enterprise at the University of Michigan. He holds a Ph.D. in agricultural and resource economics from the University of California, Berkeley (2002) and a B.S. in business marketing and management from Cornell University (1995). His major fields are environmental economics, applied microeconomics, and public policy. He teaches environmental economics and statistics.

Dr. Shimshack's specific research interests include the monitoring and enforcement of environmental laws, corporate environmental performance, transparency policies and information advisories, and environmental health. He has published several articles in academic journals and serves on the editorial council of his field's leading journal, the *Journal of Environmental Economics and Management*. His scholarship has been honored with multiple national awards. For the past several years, Shimshack has contracted with the US EPA to review the state of science related to environmental enforcement and to evaluate the effectiveness of Agency compliance assurance and enforcement activities.