

Inducing Indian Plants to Abate Pollution

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Policy Motivation

High levels of industrial pollution are a harmful byproduct of growth. The Indian state of Gujarat is an industrial powerhouse with about 5 percent of the Indian population, but 9 percent of India's registered manufacturing employment and 19 percent of output (Authors' calculation, Annual Survey of Industries, 2004-05). This growth has been accompanied by a degradation of air and water quality. Eight industrial clusters are categorized as critically polluted, tied for the most of any state, and including the two most polluted in the country (Central Pollution Control Board, 2009b). Gujarat contains three of India's five most polluted rivers and essentially all of the large cities in the state violate ambient air quality standards (Central Pollution Control Board, 2007; 2009a). Holding plants accountable for pollution is difficult when the quality of information on emissions is unreliable and regulatory

capacity strained. The High Court of Gujarat introduced an environmental audit system for the state but this system, too, has been viewed as functioning poorly. The regulator, the Gujarat Pollution Control Board (GPCB), does not trust the information from this system enough to found strong sanctions on audits, to such an extent that polluting plants recently petitioned the Court, ironically and without success, to have the audit system ended on the grounds that the GPCB was not making use of the reports.

Policy Impact

We study the response of polluting plants to the audit reform described in "Improving Third-Party Audits and Regulatory Compliance in India" This reform was carried out in a sample of small and medium-sized plants (capital investments of less than USD 2.2m) with high pollution potential, as designated by GPCB based on their

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Among the many challenges and opportunities facing South Sudan as it embarks on its newly found statehood, one is its possible accession to the East African Community ("EAC" or "Community"). Accession to the EAC presents both opportunities and challenges for South Sudan.

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product and quantity of waste effluent. The average sample plant discharges 410,000 liters of waste effluent each day. About 90% of plants are from the textile sector, the largest manufacturing sector by employment in India. We report three main findings from independent measurements of plant pollution in the endline survey. First, plants in the treatment group reduced pollution emissions relative to the control group of plants. Second, this reduction is concentrated in the water pollutants that were the original policy rationale for the audit scheme. Third, the biggest polluters cut back on pollution far more than other firms. These results show that getting accurate information to the regulator can lead to improvements in real outcomes. They are immediately relevant for environmental regulation in India. Observers of environmental regulation in the developing world despair that inducing abatement is impossible with strained and unreliable regulators. This study shows this view is overly pessimistic---plants actually respect environmental regulation when they believe they can be held accountable to standards. Small changes in regulatory design can therefore increase accountability and reduce pollution.

Audience

Water pollution has been a matter of intense public debate in India in the last ten years, prompting a number of large-scale demonstrations. Civil society groups such as the Centre for Science and Environment have often been at the forefront of conducting water quality tests and bringing the results to the public. Evidence that small, feasible changes in the regulatory framework can yield significant results may empower civil society and the public to demand better environmental protection. Environmental regulators in other states, such as Tamil Nadu and Maharashtra, have struggled with water pollution from chemical and textile plants and may be open to testing audit systems to hold plants accountable.

Policy Implications

- **Plants subject to independent audits reduced pollution.**

Plants under the reformed audit system reduced pollution as compared with plants under the standard system. The plant response is documented in Figure 1, which shows average measurements of several pollutants for plants under the modified and the standard audit systems. The pollution concentrations are substantially lower in the modified system (green bars) than in the standard system (blue bars).

- **Water pollution is reduced more drastically than air pollution.**

We measured a larger plant response for water pollution than air pollution. The GPCB prioritizes water pollution control and is much more likely to punish firms for violations of water standards. For precisely this reason, audit reports in the old scheme were unlikely to report violations of these important pollutants. Firms responded to accurate reports on their water pollution emissions more strongly because these reports put them at greater risk of sanction.

- **Pollution reduction is concentrated amongst the most polluting plants.**

Possible penalties for firms exceeding the regulatory standard include warnings, fines, plant closure and disconnection of water and electricity. The two most severe punishments, closure and utility disconnection, are meted out almost exclusively to firms that exceed the standards by the greatest degree. Getting accurate information to the regulator on the true level of pollution thus reduced pollution the most for the plants that were most polluting to start and therefore had the most to lose from full disclosure. In the absence of a strong enforcement regime, the weaker penalties had a small abatement effect.

Implementation

- **Increase auditor independence from firms.** With properly aligned incentives (for details, see our other brief, "Improving Third-Party Audits and Regulatory Compliance in India"), auditors provide statistically accurate information on plant pollution levels. Firms respond by reducing pollution.

- **Broaden regulatory scrutiny.** Plants that were clearly at risk of sanction for big violations of standards for important water pollutants, abated pollution the most by far in response to the audit intervention. Subject to constraints on regulatory enforcement capacity, this suggests that broader regulatory scrutiny, such as for particulate matter emissions, may also improve environmental quality.

- **Strengthen other channels for regulatory information.** Consultants for Environmental Impact Assessments and the regulator's own staff may also have incentives to underreport pollution. Independent verification of these reports, such as through overlapping monitoring regimes, may have similar effects as seen for environmental audits.

Dissemination

We are working with GPCB to make the modified audit system permanent. We are also exploring other systems for inducing firms to reduce pollution. An emissions trading system (ETS) is being tested in Gujarat in 2012 and 2013, which we expect will concentrate abatement in low-cost firms, reducing total costs. In other jurisdictions, ETS have been successful in drawing firms into the regulatory framework by offering the incentive of emission credits based on existing pollution to those that come forward. Since we suspect that there are a large number of firms with emissions above the regulatory standard who can reduce emissions relatively cheaply, this could be a large benefit.

Further Readings

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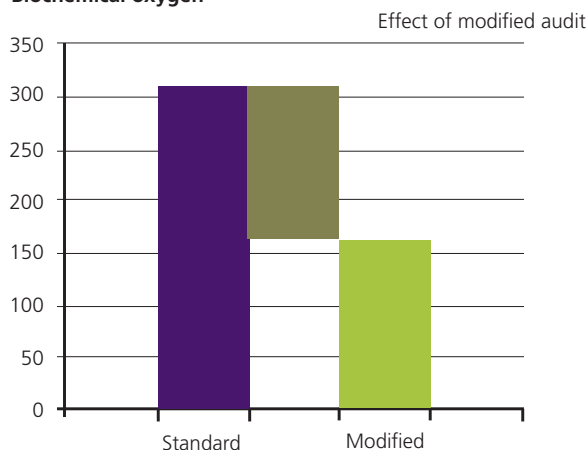
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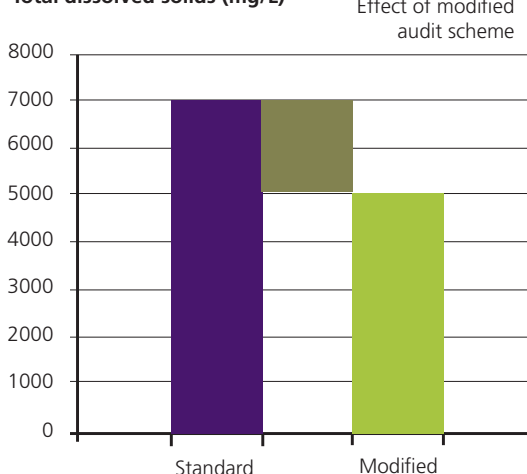
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Biochemical oxygen



Total dissolved solids (mg/L)



Suspended particulate matter (ppm)

