



Using evidence to improve pollution regulation in India

Rapid industrial growth in India has greatly improved living standards but has come at the cost of widespread environmental damage, including high levels of particulate matter, air pollution and contaminated water resources. Despite recent research linking the high levels of air pollution to avoidable death and disease, pollution control bodies struggle to enforce environmental regulations.¹

This challenge is prominent in Gujarat, home to India's most critically polluted industrial cluster and six of its most polluted river stretches. The state government's emphasis on economic growth and ease of doing business has spurred industrial expansion – particularly in polluting industries such as petrochemicals, pharmaceuticals and textiles – that environmental regulatory capacity has not been able to match.² The resulting pollution has

increasingly inspired citizen outrage and activism to reduce it. As a result, Gujarat is the only state implementing a court-mandated third-party industrial pollution audit system on top of checks by the Gujarat Pollution Control Board (GPCB).

Between 2009 and 2013, 3ie supported an impact evaluation to improve the state's environmental audit system for monitoring and regulating industrial pollution. Researchers at Jameel Poverty Action Lab (J-PAL) South Asia, Harvard University and Massachusetts Institute of Technology, in close collaboration with the GPCB, studied the effects of changes designed to improve the GPCB's third-party audit system. This brief describes how evidence from that evaluation has been used and the factors that contributed to evidence-informed innovation in regulating industrial pollution.

Highlights

Evidence use

- The GPCB acted on study recommendations to allocate independent third-party auditors to polluting firms on a random basis and pay them a predetermined fee.
- Study findings have informed discussions of best practice in Indian environmental regulation at the national level and amongst other state pollution control boards.
- The study findings informed United States Environmental Protection Agency (US EPA) guidance to its regulators on how to include resource-efficient and evidence-informed environmental compliance tools.
- The study team and the GPCB continue to collaborate to design and evaluate new methods for monitoring and regulating industrial pollution.

Factors influencing evidence use

- Broad agreement amongst key stakeholders, including industries and auditors, that Gujarat's environmental audit system was not working.
- Strong formal involvement of the implementing agency (the GPCB) existed from the start, with departmental approval for interventions being studied and representation on the study team.
- Clear and convincing findings on the extent of false reporting showed how it could be fixed.
- Wide engagement through evidence champions in Indian government agencies and with the US EPA was ongoing.
- Context was important – Gujarat's unique institutional history of judiciary-monitored industrial pollution regulation.

Gujarat's third-party audit system

In 1995, farmers in Gujarat initiated legal proceedings against the state government for its inaction in preventing the dumping of industrial effluent and sewerage into Kharicut, an irrigation canal. In response, the Gujarat High Court mandated third-party environmental audits for polluting industries in addition to routine inspections by the GPCB.³ While the GPCB implemented the court-imposed system to monitor pollution through third-party auditors, no one affected by the mandate – the pollution control board, civil society, industries or private auditors – felt it was working.

Although the GPCB was responsible for making polluting industries pay, it was understaffed and had limited resources to inspect all polluting firms. The third-party auditors responsible for accurately measuring and reporting industrial pollution levels to the GPCB were being contracted and paid by the polluting industries themselves. According to Hardik Shah, a principal investigator on the study while he worked as a GPCB administrator, the payment was barely enough for third-party auditors to measure and report pollution satisfactorily.^{4,5}

In reality, the GPCB could neither inspect the firms nor rely on third-party audit reports. Given the mismatch in incentives and conflicts of interest, air and water pollution continued to worsen, and civil society organisations kept up the pressure on the GPCB and firms through discourse in the media and legal action.⁶ At the same time, industry representatives sought multiple extensions and petitioned the court to reconsider the judgement that set up the third-party audit system. Following discussions about what could be done to fix the system, the GPCB and the study team decided to evaluate mechanisms that would reduce conflicts of interest for third-party auditors employed by industry in two industrial centres in Gujarat.⁷

The team identified three mechanisms to improve the audit system as part of the evaluation: (1) random allocation of third-party auditors to firms; (2) predetermined payments from a central pool; and (3) on-site rechecking of a random sample of the auditors' work. The study showed that the existing arrangement of industrial firms hiring and paying their own auditors encouraged corruption and misreporting of industrial emissions.

A large proportion of firms operating in this fashion were reported to be polluting just below the levels that would attract regulatory attention. Independent audits with predetermined payments and on-site rechecking of audit data on a random basis produced more accurate information and prompted firms to lower pollution. Compared to firms audited under the existing system, false reports of compliance with emissions norms were reduced by 80 per cent.

[W]e went there to investigate and happened upon these different interesting questions like this audit scheme and whether it was working and whether the allocation of the board's own inspections was basically done in a rational manner and how that affected pollution and so forth.... Initially this lawyer [representing the GPCB] had approached and made a connection, but thereafter it took some time to develop the idea and the partnership.

Nicholas Ryan

principal investigator on the
3ie-supported impact evaluation



Improvements, innovation, and catalysing state and national action

The evaluation findings showed both the extent of the problem of false compliance and promising means to address it. The study findings have contributed to revisions to Gujarat's third-party audit system and informed discussions on industrial pollution inspections across state pollution control boards. National-level decision makers also took notice, including the Ministry of Environment, Forest and Climate Change and NITI Aayog, the national government's former planning commission and now its premier think tank. Early engagement around the findings, placed in the broader context of environmental regulation and facilitated by local think tanks, contributed to a partnership amongst the research team, the Central Pollution Control Board and the GPCB for innovating and evaluating new mechanisms for controlling pollution.

Informing revisions in third-party audit norms

In 2012, informed by the 3ie-supported impact evaluation's recommendations, the top GPCB leadership formally approved modifications to the board's environmental audit scheme. According to the revised approach, which cited findings from the 3ie-supported study, independent third-party environmental auditors would be randomly allocated to industrial plants, paid a predetermined fee and have their work rechecked by expert academic auditors.⁸ The board implemented these changes three years later, in January 2015.

The first two changes were implemented through modifications to the GPCB's online regulatory compliance management software, the Extended Green Node.⁹ However, as of 2019, GPCB officials continue to scrutinise audit reports themselves, rather than contracting with academic auditors to recheck audit data on-site.¹⁰

Catalysing collaboration for further evidence-informed regulatory innovation

In 2010, before presenting the recommendations to the GPCB's leadership, the study team presented interim findings at a national workshop on environmental regulation innovations, organised by the Ministry of Environment, Forest and Climate Change. Attendees included state pollution control boards and national-level agencies interested in environmental regulation. Interactions during the workshop led the then union minister to ask them to produce a discussion paper on moving towards emissions trading and market-based environmental regulation in India.¹¹ Guided by the discussion paper, the ministry's Central Pollution Control Board and state pollution control boards, including the GPCB, formally collaborated with the research team to design and evaluate industrial emissions trading.¹²

[M]ore exciting than even just what we found is [that]...we now have this unbelievable collaboration...and so we're now working with the government of India and, in particular, with Gujarat to set up...a cap-and-trade programme in India for particulate [emissions].

Michael Greenstone
principal investigator
on the 3ie-supported
impact evaluation



Informing policy discussions on improving pollution regulation

The study team and the GPCB presented the findings to pollution regulators in other states at the ministry's workshop and other routine meetings. Many of those regulators went on to assess the relevance of the model in their contexts. The Odisha and Andhra Pradesh state pollution control boards, for example, carried out wide consultations on variants of Gujarat's modified third-party audit scheme for industries in their states.¹³

However, neither regulator implemented any changes to their system; officials from both state pollution control boards said they were continuing to follow the rules under the 1986 environment protection law instead. As of 2019, the rules only require regulated firms to self-certify their compliance with pollution norms by filing an annual environmental statement.

Although national environmental regulation and associated state pollution control board rules have yet to change, lessons from the evaluation have influenced the

National Clean Air Programme action plan, prepared by the Ministry of Environment, Forest and Climate Change. The programme encourages other states to adopt the modified third-party audit scheme, as in Gujarat.¹⁴ The Ease of Doing Business division of the Ministry of Commerce and NITI Aayog have also highlighted the scheme as a best practice for state pollution regulators.¹⁵

More recently, NITI Aayog endorsed the audit norms that the study recommended in *Breathe India: an action plan for combating air pollution*, issued in 2018, which advises states on 15 measures for multisectoral action on air pollution.¹⁶

The researchers also engaged with the US EPA about the study findings. As a result, the agency's Next Generation Compliance Initiative (2015–2017) included third-party certification as a resource-efficient compliance tool for federal and regional environmental regulators.¹⁷ Guidance from the initiative and a publicly available compendium of examples cite the 3ie-funded study in illustrating ways to establish effective independent verification.¹⁸

Factors influencing evidence use

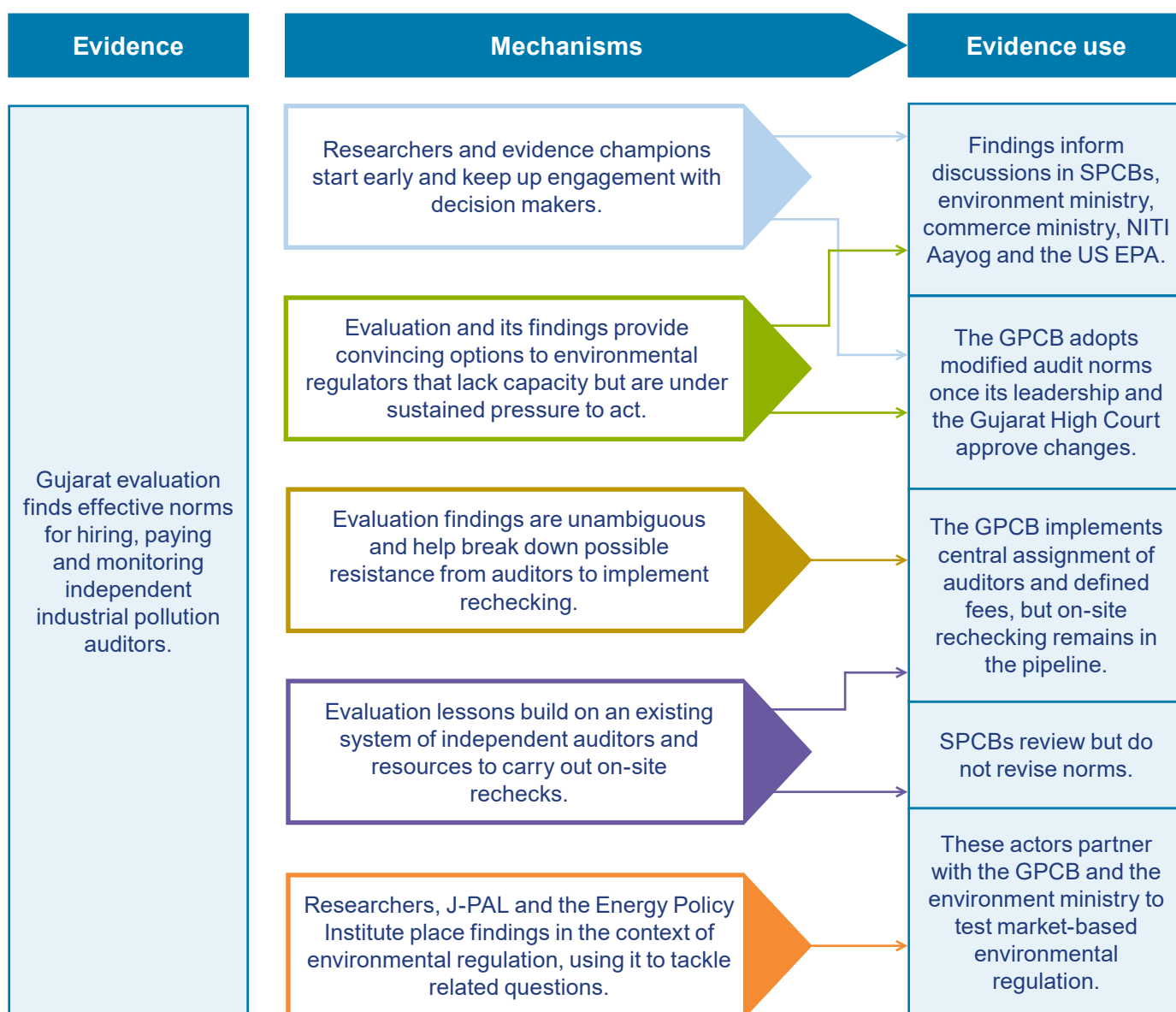
Researchers and GPCB representatives have both said that clear findings from the rigorous evaluation and close engagement between researchers and the GPCB were the keys to convincing stakeholders to review Gujarat's third-party industrial pollution audit system. The initial relationship with the GPCB, as well as broader engagement with Indian agencies, now forms the basis of a partnership to undertake additional evaluations in India.

By placing the study findings in the larger context of environment regulation, the study team engaged with decision makers in Indian agencies, including the Ministry of Environment, Forest and Climate Change and other pollution regulators, and the US EPA. However, other contextual factors played an important contributory role. Citizen action had already

challenged business-as-usual environmental regulation in Gujarat, setting the stage for the study and the revised audit scheme. The history of citizens going to court to demand improved pollution regulation created the precondition for the revised third-party audit system. And, unlike other states, Gujarat had an existing set of third-party environmental auditors.

This specific enabling environment for change in Gujarat is an important reason the norms recommended by the study, despite being highlighted as a best practice, have not led to a change in national laws or audit regulations administered by other state pollution control boards. Even in Gujarat, despite the board adopting the evidence, the process of acting on that evidence has been delayed and constrained by factors outside the GPCB's control, such as getting approval from the court.

Figure 1: Mechanisms by which the study contributed to evidence use



Broad agreement over the need to fix third-party audits

None of the stakeholders were satisfied with the existing third-party audit system. Media reports and submissions by civil society representatives about the severity of the pollution had prompted the Gujarat High Court to register a case on its own motion in 2004. This case concluded in late 2008, the same year that discussions about the evaluation started. Media and civil society organisations continued to publicise concerns about the independence of the auditors and the difficulties with air and water pollution while the GPCB initiated the evaluation in 2009.

Formal involvement of the implementer from the start

The GPCB's buy-in and close involvement in the evaluation design and implementation phases were crucial for promoting access for the researchers, their understanding of the system and the GPCB's use of the evidence. According to one of the study's principal investigators, interest and

demand from the GPCB bureaucracy triggered the study. The research team and the GPCB jointly drafted the research application to the Gujarat government. Although the process took time, the government's approval helped establish a formal relationship. The team highlighted this formal arrangement as being especially useful while working with a government partner. Working closely with the GPCB also helped sustain a partnership that went beyond a single evaluation.

Clear and convincing findings

Speaking at a conference on effective environmental regulation in 2013, then GPCB administrator and study principal investigator Hardik Shah said the evaluation came out with such 'clear, transparent and convincing results' that the GPCB was able to convince the existing third-party auditors and obtain approval from the GPCB's directors to implement the three recommended changes and amend the scheme. For Shah, the evaluation revealed the flaws in the environmental audit scheme and offered GPCB leadership effective ways to improve it.¹⁹

Value of evidence champions and wider engagement

Shah, who was a top administrator at the GPCB until 2015, ensured the intervention was implemented as planned and the findings had an internal evidence champion, despite multiple changes in the GPCB leadership. While at the GPCB, Shah also presented the findings to the top leadership of the other 35 state pollution control boards in India, with some, such as the Andhra Pradesh Pollution Control Board, later sending delegates to Gujarat to learn more about the GPCB model.

The research team engaged widely by leveraging their experience in evaluating changes to command and control inspection-based environmental regulation. They presented interim findings to the then union minister of environment, forest and climate change and partnered with the ministry to pilot and evaluate technology-aided pollution monitoring and market-based environmental regulation.

Since 2015, the two organisations with which the researchers are affiliated – J-PAL South Asia and the Energy Policy Institute at the University of Chicago's Delhi Centre – have continued to work with the GPCB and share the evaluation evidence through national conferences on innovations in pollution regulation.²⁰ The Energy Policy Institute at the University of Chicago also provided the platform for the researchers to share evaluation findings with the US EPA.

In India, the audit norms have been featured as a successful model for pollution regulation for nearly a decade, reflecting sustained engagement with the study findings. NITI Aayog first talked about the model in 2011 as one of the successful policy models for pollution regulation, and again in 2018 as part of the *Breathe India* action plan. The commerce ministry promoted Gujarat's reform as an Ease of Doing Business measure in 2016, and the environment ministry's 2019 National Climate Action Plan document cites it.

Importance of context for using evidence

Complex and dynamic contextual factors can accelerate or limit evidence-informed decisions and actions in ways that even those identified as decision makers cannot control.

The third-party audit system was a result of the Gujarat High Court's directive; therefore, any modification to it required the court's approval. This approval only came in 2015, three years after the GPCB leadership's initial endorsement. Other states that have demonstrated interest in the GPCB model do not have a similar history of court-imposed third-party audits. For the Andhra Pradesh and Odisha pollution control boards, neither of which has a third-party audit system, changing the inspection norms would not be easy.²¹ Even if they decided to modify their prevailing norms, the decision would be open to legal challenge under the unchanged state pollution regulations and constrained by the absence of an existing system of third-party auditors.

Even in Gujarat, although there is an established, decades-old system with multiple third-party auditors in the private sector, on-site rechecking of audit data remains unimplemented five years after the study. According to a former GPCB official, 'When the whole scheme was presented for implementation, only a few of the suggestions which were practicable were taken up and the rest were kept...for implementation at a later stage'. Although none of the officials shared a reason for not implementing random rechecking of third-party auditors' work, human or financial resources and the influence of existing auditors could be constraining factors.

Conclusion

The changes in the GPCB's third-party audit scheme for regulating industrial pollution drew directly from impact evaluation findings. However, change did not take place as soon as the findings were available, and changes have drawn upon the findings, rather than replicating them precisely. Along with the clear findings, important contributing factors to change included a supportive political and policy context, strong relationships and wide engagement. The mechanisms by which evidence interacted with these contributing factors have influenced the nature and extent of change. As of 2019, the partnership the study generated continues to contribute to evidence uptake inside and outside India and has created opportunities for these researchers to do further evaluations.





Endnotes

- ¹ India State-Level Disease Burden Initiative Air Pollution Collaborators, 2019. The impact of air pollution on deaths, disease burden, and life expectancy across the states of India: The Global Burden of Disease Study 2017. *The Lancet Planetary Health*, 3, pp.e26–e39. Available at: doi: [https://doi.org/10.1016/S2542-5196\(18\)30261-4](https://doi.org/10.1016/S2542-5196(18)30261-4) [Accessed 26 March 2019].
- ² In January 2019, while hearing a case about industrial effluent contaminating river water in Gujarat, India's top environmental court, the National Green Tribunal, ordered the Central Pollution Control Board to conduct a performance audit of all state pollution control boards and committees in India. Press Trust of India, 2019. Green Tribunal orders performance audit of state pollution control boards, NDTV [online] [last updated 8:47p.m. on 16 January 2019]. Available at: <https://www.ndtv.com/india-news/green-tribunal-orders-performance-audit-of-state-pollution-control-boards-1978763> [Accessed 26 March 2019].
- ³ Gujarat Chamber of Commerce and Industry versus Pravinbhai Jashbhai Patel (1996) Special Civil Application no. 770 of 1995 (High Court of Gujarat at Ahmedabad). [Unreported] Available at: <https://indiankanoon.org/doc/4420036/> [Accessed 26 March 2019].
- ⁴ Making environmental regulation effective: experimental evidence from India (2013) (Centre for Effective Global Action at the University of California – Berkeley, Evidence to Action: Promoting Global Development in a Changing Climate, research symposium video, 25 April 2013) Available at: <https://youtu.be/OzfuXkJnwGo?t=960> [Accessed 26 March 2019].
- ⁵ Shah is now private secretary to the union minister for environment, forest and climate change.
- ⁶ More than 340 orders are listed under the case filed by the farmers (Pravinbhai Jashbhai Patel versus State of Gujarat and Others, SCA 770 of 1995) between 1995 and 2014. The Gujarat High Court too registered a case on its own motion that ran from 2004 to late 2008.
- ⁷ Duflo, E, Greenstone, M, Pande R and Ryan, N, 2013. Truth-telling by third-party audits and the response of polluting firms: experimental evidence from India, 3ie Impact Evaluation Report 10. New Delhi: International Initiative for Impact Evaluation.
- ⁸ Gujarat Pollution Control Board, 2015a. Environmental audit scheme. at a glance. Government of Gujarat. Available at: <https://gpcb.gujarat.gov.in/uploads/environment-audit-scheme.pdf> [Accessed 26 March 2019].
- ⁹ Gujarat Pollution Control Board, 2015b. Office order. Gandhinagar. Available at: <https://gpcb.gujarat.gov.in/uploads/office-order-for-modification-in-EA-scheme-dated-23-01-2015.pdf> [Accessed 26 March 2019].
- ¹⁰ Multiple officials interviewed mentioned that on-site rechecking of a random sample of auditor's work remains in the 'pipeline'.
- ¹¹ Gujarat Pollution Control Board, 2010. Towards an emissions trading scheme for air pollutants in India: a concept note. MoEF Discussion Paper. Available at: <https://gpcb.gujarat.gov.in/uploads/moef-discussion.pdf> [Accessed 27 March 2019].
- ¹² Press Information Bureau, 2010. MOEF Introduce Pat System to control air pollution. Pilot projects in Gujarat and Tamil Nadu. New Delhi. Available at: <http://pib.nic.in/newsite/PrintRelease.aspx?relid=65466> [Accessed 27 March 2019].
- ¹³ Odisha State Pollution Control Board, 2016. Circular. Third-party inspection of medium risk industries. Available at: <http://ospboard.org/wp-content/uploads/2017/01/Third-Party-Inspection-1.pdf> [Accessed 26 March 2019].
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- ¹⁵ Planning Commission, 2012. Successful models of implementation of environmental policies and programmes in states. Available at: http://planningcommission.gov.in/reports/sereport/ser/successful_models09072012.pdf [Accessed 26 March 2019].
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- ¹⁸ US EPA, 2016. Compendium of next generation compliance examples in Clean Air Act programs. Washington DC: United States Environmental Protection Agency (US EPA), pp.15–16. Available at: <https://www.epa.gov/sites/production/files/2016-09/documents/caanextgencomplcompendium.pdf> [Accessed 9 July 2019].
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- ²⁰ Energy Policy Institute at the University of Chicago, 2017. National Conference on Air and Water Pollution: Innovations in Regulation, Abatement and Monitoring, New Delhi. Available at: https://epic.uchicago.edu/sites/default/files/NITI%20Aayog%20EPIC%20India%20July%207%20Conference%20Agenda_0.pdf [Accessed 27 March 2019].
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About evidence use briefs

Since 2017, 3ie has been publishing examples of evidence uptake and use in the [3ie evidence use series](#). Each brief showcases a 3ie-funded evaluation or systematic review and analyses how context, actors and other mechanisms contributed to or limited the use of evidence in policies and programmes.

About the impact evaluation

The 3ie-supported impact evaluation by [Esther Duflo and colleagues \(2013\)](#) used a randomised controlled trial with two treatment arms to show how changes to third-party audit norms in 233 of 473 audit-eligible firms, combined with rechecking of a random set of the auditors' work, affected auditors' independence in measuring and reporting emissions to enable better regulation of industrial pollution.

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About this brief

This brief examines the factors that have contributed to the uptake and use of evidence from the 3ie-supported impact evaluation during and after it was conducted, between 2009 and 2013. The analysis emphasises context and plausible mechanisms for evidence uptake and use, drawing from the realist framework of theorising how change takes place.²² The authors used contribution tracing methods to test the causal claims about how study findings have been used and how they have contributed to changes.

The authors relied on 3ie's extensive monitoring data collected during the study, including grant documents and regular study reporting, using 3ie's stakeholder engagement and evidence uptake and use plan. They also reviewed online data, including court judgements, news reports and seminar papers relating to the study, and conducted phone interviews with principal investigators in 2018 and 2019.

The authors conducted this investigation six years after the study was completed. Only a limited number of research team members and implementing agency staff could be interviewed. To address this limitation, the brief draws from research and interviews carried out in 2014 by 3ie's then partner, Centre for Poverty Analysis, and from videos of presentations by key stakeholders that are available online.

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