The Coalition of Finance Ministers for Climate Action

How Ministries of Finance and economic decision-makers can use ex-post pilot assessments to inform climate policy: designing, testing, and scaling emissions markets in India

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Rigorously piloting and evaluating climate and environmental policies before scaling them up can be a good way to help ensure public sector investments are effective and cost-effective. The Government of Gujarat, India, adopted this design-test-scale approach in rolling out its first emissions trading scheme to reduce industrial pollution.

The Government worked with researchers from the Abdul Latif Jameel Poverty Action Lab (J-PAL)[1] to conduct a randomized controlled trial (RCT)[2] to measure the impact of the emissions market on industrial pollution and industry costs in one city before deciding whether to scale it up. It identified 317 industrial plants to participate in the pilot, of which 162 were randomly assigned to join the emissions market and the remaining 155 served as the comparison group. Researchers compared the emissions and abatement costs in the two groups using continuous emissions monitoring system data, emissions trading data, and surveys from September 2019 to April 2021. The study found the emissions market cut air pollution by 20%–30% and reduced firms' average abatement costs (Greenstone et al., 2025).

Informed by this evidence, the Government scaled the emissions market to reach over 15 million people in Surat and Ahmedabad, generating estimated health benefits of over $25 per $1 spent, and this inspired other states in India to scope similar emissions markets. This case study highlights the potential for emissions markets in emerging economies and demonstrates how impact evaluation can help governments ensure climate policies have a high return on investment before scaling them.

Pollution markets can be an effective and cost-effective way to cut emissions in emerging economies

Air pollution kills millions of people every year and significantly decreases life expectancy (WHO 2022, Ebenstein et al., 2017). Since 2009, the Government of Gujarat's Pollution Control Board (GPCB) in India has collaborated with researchers Michael Greenstone, Rohini Pande, Nicholas Ryan, and Anant Sudarshan, J-PAL South Asia, and EPIC India to design, test, and scale reforms to cut pollution (see their groundbreaking study: Greenstone et al., 2025).[3]

Like many regulators, Gujarat primarily uses command-and-control regulation, which set caps on individual firms' pollution. When enforcement resources are limited, such regulations can suffer from imperfect compliance, poor or corrupt monitoring, and weak enforcement (Duflo et al., 2013, 2018; Oliva, 2015; Zou, 2021). They also do not differentiate between smaller and larger firms; these face different costs of abating pollution, potentially hindering business growth.

An alternative is an emissions trading scheme (ETS), which sets a cap on the total pollution across all regulated businesses and allocates pollution permits to firms, which they can trade. This market allows firms with lower costs of abatement to reduce pollution more and those with higher costs to reduce pollution less, which has the potential to reduce pollution at a lower cost to industry overall. These schemes have been successful in reducing pollution in high-income countries. However, ETSs are rarely used in low- and middle-income countries, where pollution levels are highest but enforcement capacity is lower (Ellerman et al., 2000; Martin et al., 2016; Dechezlepretre et al., 2023, Stavins, 2003; Blackman et al., 2018).

To ensure that this major emissions market reform was cost-effective before deciding whether to scale it, the Government worked with researchers to conduct what is likely the world's first RCT of a pilot ETS, in several hundred industrial plants in a major city (Surat) from September 2019 to April

1 https://www.povertyactionlab.org/.

2 Randomized evaluations are a type of impact evaluation method. Study participants are randomly assigned to one or more groups that receive an intervention, known as the "treatment group," or a comparison group that does not receive the intervention during the study period. Researchers measure the outcomes of interest in the treatment and comparison groups after the intervention is implemented. Randomized evaluations make it possible to obtain an unbiased estimate of the causal impact of an intervention; in other words, what specific changes can be attributed to the intervention. For more see the video at https://www.youtube.com/watch?v=mSYm9M3taf0.

3 See also the Policy Brief at https://www.povertyactionlab.org/evaluation/impact-emissions-trading-scheme-economic-growth-and-air-quality-india.

2021. The Government first identified 317 industrial plants to participate in the study. From this sample, 162 plants were randomly assigned to participate in the pilot emissions market. The remaining 155 plants continued with the status quo pollution regulation and served as the comparison group. The researchers measured the pollution emissions and abatement costs of the industrial plants in the two groups using a combination of continuous emissions monitoring system (CEMS) data, trading data, and surveys. The results show that the ETS was effective in reducing particulate matter emissions from industrial firms by 20%–30%.[4] The researchers used trading data from the emissions market to estimate firms' marginal abatement cost curves (MACs) and estimated that, holding emissions constant, average abatement costs were 11% lower in the market relative to the status quo regulation (Greenstone et al., 2025).

This actionable evidence helped the Government make the case for scaling the emissions market in cities across the state after the study ended. The researchers and J-PAL continued to support the Government in setting up the trading platform, training regulators and firms in how to use it, hosting mock trading, launching real trading, and resolving implementation and data issues. Since 2022, the Government has scaled the market to two major cities, Surat and Ahmedabad, reaching more than 15 million people, and it planned to expand the ETS to several more cities by 2025. Informed by this work, several other Indian states are also exploring plans to launch emissions markets for particulate matter and other pollutants. The approach is particularly relevant in states that have rolled out continuous emissions monitoring following India's national standards (Central Pollution Control Board 2013), including Maharashtra and Tamil Nadu. In this way, in alignment with the Helsinki principles,[5] building emissions markets also helps lay the groundwork for carbon trading.

Rigorous impact evaluations provide evidence to inform and improve policy so it is effective and cost-effective

For Ministries of Finance and economic policymakers, empirical evidence from impact evaluations such as the Gujarat ETS study can help inform and improve critical decisions relating to fiscal and industrial policy and budget allocations. Quantifying health benefits and economic returns provides MoFs with actionable insights to advance sustainable investments in pollution abatement. For example, the ETS study showed that every dollar spent on the reform generated $25 in widespread health benefits to the population by reducing early deaths. These high returns only include the benefits of reduced mortality, but there is evidence pollution also negatively affects cognitive performance and worker productivity, suggesting improvements in air quality may have economic benefits in addition to health benefits (Borgschulte et al., 2022, Carneiro et al., 2021, Chang et al., 2019, Lavy et al., 2014, Schikowski and Altuğ, 2020). The Gujarat ETS study also demonstrated that these public health benefits did not significantly increase the costs to industry, which saw lower average abatement costs under the ETS for a given level of emissions. This example highlights how a data-driven approach can enhance policy effectiveness and support strategic planning by integrating environmental externalities into economic decision-making frameworks.

Practical implementation: using evidence in policy design

MoFs can make practical use of this research on two levels. First, the design-test-scale model can be a useful approach for identifying and implementing innovative policies at a large scale, even in challenging contexts. The use of rigorous impact evaluation methodologies such as RCTs enables access to cost-effectiveness estimates for comparison across policy options. Second, MoFs can use the findings from the Gujarat ETS study to explore the potential benefits and costs of emissions markets in their contexts. These resources facilitate evidence-based policy design and implementation, offering transparency and accessibility in decision-making processes.

More broadly, investing Government resources to incentivize innovation, evaluation, and scale can help accelerate the development of effective climate technologies and policies. This model, pioneered

4 https://www.povertyactionlab.org/evaluation/impact-emissions-trading-scheme-economic-growth-and-air-quality-india.
5 https://www.financeministersforclimate.org/promote.

by the U.S. Agency for International Development's Development Innovation Ventures, generated at least $17 in benefits for people in developing countries per $1 spent (Kremer et al., 2021).

Challenges and insights for effective implementation

A key lesson from the Gujarat ETS study is the feasibility of integrating market mechanisms into pollution regulation to achieve environmental objectives cost-effectively in emerging economies. Challenges include initial setup costs, continuous emissions monitoring technology, regulatory harmonization, and ensuring equitable participation among industries. Addressing these challenges requires sustained institutional support and capacity-building efforts tailored to local contexts.

Conclusions and recommendations

The Gujarat ETS exemplifies a transformative approach to environmental regulation, demonstrating the potential of market-based solutions to mitigate pollution and enhance economic efficiency as well as the complementarity between the state and the market in solving environmental challenges.

- The negative impacts of pollution are vast and often overlooked, especially in low- and middle-income countries. Identifying cost-effective ways to reduce local pollutants can also lay the groundwork for regulating carbon emissions in the future.
- Governments can use a design-test-scale approach when implementing new environmental policies to ensure that large-scale reforms are effective, cost-efficient, and grounded in real-world results. The Gujarat ETS study shows that emissions markets are possible to implement and can be highly effective, including in emerging economies.
- The scaling of emissions trading schemes in Gujarat, India, highlights an opportunity to reconcile growth and environmental quality for resource-constrained governments by moving toward more nimble mechanisms that reduce pollution at a lower cost to firms.

As MoFs are considering various policy options for combatting climate change, they should ask whether there is credible causal evidence the policies are effective or not. When such evidence exists, they should use it to inform which policies they invest in. They can also incorporate these real-world impact estimates into their models to improve the quality of their projections of the impact of various policy choices. If there is not yet credible causal evidence a policy is effective, governments should consider investing in a small number of strategic impact evaluations to measure the impact of major reforms to ensure they are effective and cost-effective before scaling them up widely.

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About J-PAL

J-PAL is a global research network dedicated to reducing poverty by ensuring policy is informed by scientific evidence. J-PAL's King Climate Action Initiative works with policy partners around the world to design, test, and scale evidence-informed solutions to combat climate change and poverty. To learn more and explore collaboration, contact Claire Walsh (cwalsh@povertyactionlab.org).