Decoding Green Justice: AI-Assisted Analysis of Environmental Court Rulings in India

A. Patrick Behrer [1] Daniel L. Chen [1,2] Shareen Joshi [3] Olexiy Kyrychenko [4] Viknesh Nagarathinam [1] Peter Neis [5] Shashank Singh [6]

[1]WB [2]TSE [3]Georgetown U [4]Radboud U [5]CERDI [6]Chicago U

Air Pollution and Judiciary in India

- The India Pollution Puzzle
  - Robust environmental legislation (similar to the US) that ought to be effective
  - Air pollution in India remains among the worst in the world
- Role of the Judiciary
  - Emerged as a proactive force through Public Interest Litigation
  - Courts influence & dictate environmental policy and monitor implementation of the orders
- Are the court rulings effective?
  - Researchers struggle to systematically analyze the impact of these court interventions
  - There is no publicly available dataset of all environmental cases in India

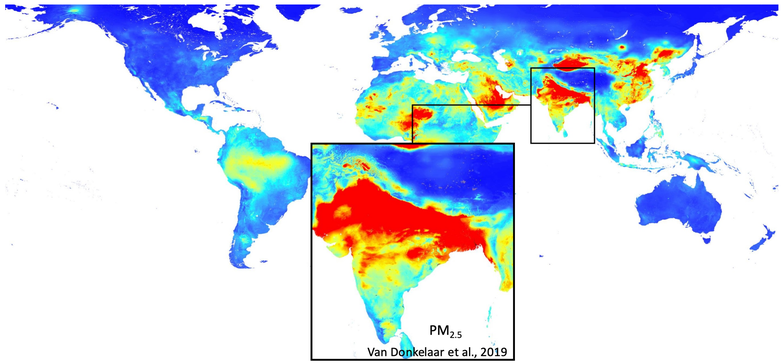

Figure 1. Air pollution levels across India

Unique AI-Assisted Dataset

- Data availability and quality
  - Digitization of judicial records created new opportunities
  - Legal analysis are still limited by data complexity and inconsistency
- Compiling new dataset
  - Identified key environmental laws (Water Act 1974, Air Act 1981, EPA 1986)
  - Collected around 2,000 judicial rulings citing these acts from IndianKanoon.org
  - Recruited law students to manually review and classify these initial cases
  - Most significant question was whether the judgment was pro-environment (*green*)
  - Expanded dataset by including the cases citing 23 additional relevant environmental laws
  - Used AI (GPT-4 & Claude) to classify all cases based on human-coded benchmarks
- Our case-level dataset
  - Final corpus: 12,615 environmental court rulings
  - Coverage: 1981–2020, spanning roughly 600 districts across India
  - Rich dataset, including information about types of courts, petitioners/respondents, etc.

Robustness

- **Compared** GPT-4 and Claude against human expert analysis in manually reviewed cases
- **GPT-4** demonstrates robust accuracy rates compared to human expert analysis
- **AI efficiency and human insight** provide an accurate view of environmental jurisprudence

Some Findings

- **Increase in Cases**: Number of cases and share of green cases have increased over time
- **Limited Pro-Environment Outcomes**: Only 30% of cases favor environmental protection
- **Geographical Concentration**: Cases are concentrated in cities and the "cleaner" south

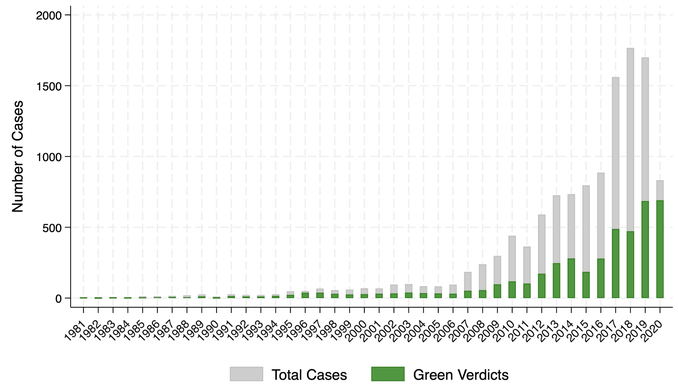

Figure 2. Environmental court cases in India

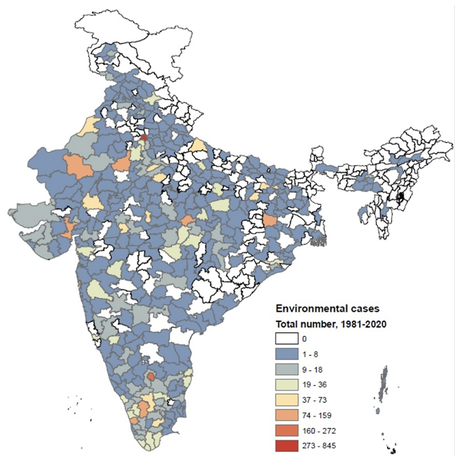

Figure 3. Distribution of cases across India

Policy Implications

- **Tracking Implementation Gaps**: activism doesn't always lead to real impact
- **Accountability & Transparency**: AI-assisted tracking could improve enforcement
- **Policy Design**: Understanding court patterns could lead to better environmental regulation

Delhi Case Study

- The World's Most Polluted Capital
- **Judicial Hotspot**: majority of environmental cases are from Delhi courts
- **Subsample**: 1,077 court cases combined with air pollution & weather data, N=480 (monthly)

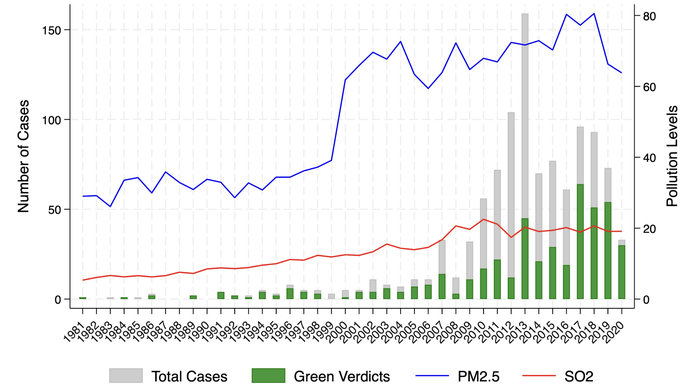

Figure 4. Environmental court cases and air pollution in Delhi

Empirical Strategy and Results

- **Monthly Time Series Analysis** with time trend, controls & Newey-West standard errors
- **Effectiveness of Green Verdicts** in reducing air pollution (eq. 1)
- **Court-Specific Impact**: Higher vs. Lower courts (eq. 2) as former are more pro-green

$$Y_t = \alpha + \beta_1 \text{GreenShare}_t + \gamma X_t + \delta \cdot t + \epsilon_t \quad (1)$$

$$Y_t = \alpha + \beta_1 \text{GreenShare}_t^{Higher} + \beta_2 \text{GreenShare}_t^{Lower} + \gamma X_t + \delta \cdot t + \epsilon_t \quad (2)$$

Table 1. Effect of green orders on air pollution

	$PM_{2.5}$		SO_2	
	(1)	(2)	(1)	(2)
Share of green verdicts, All courts	-0.051**		-0.010*	
	(0.025)		(0.005)	
Share of green verdicts, Higher courts		-0.084***		-0.018**
		(0.023)		(0.006)
Share of green verdicts, Lower courts		0.025		0.003
		(0.040)		(0.006)

Conclusion

- **Judicial Activism** alone is *insufficient*: better enforcement & executive actions are needed
- **Higher Courts** rulings resulted in *small but significant reductions* in $PM_{2.5}$ & SO_2
- **Effects** propagate through *reduced dust and lower emissions* from building energy use

olexiy.kyrychenko@ru.nl