

# OPTIMIZATION FOR MULTI-OBJECTIVE ENVIRONMENTAL POLICYMAKING

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## INVENTORS

» Apte, Joshua S.

## OTHER INFORMATION

### CATEGORIZED AS

» **Environment**

» Other

» Remediation

» Sensing

» **Engineering**

» Engineering

» Robotics and Automation

» **Research Tools**

» Bioinformatics

» Screening Assays

» **Sensors & Instrumentation**

» Environmental Sensors

» Scientific/Research

### RELATED CASES

2026-025-0

## PATENT STATUS

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Patent Pending

## BRIEF DESCRIPTION

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Traditional environmental policymaking often struggles to efficiently target interventions to achieve multiple, complex air quality goals simultaneously across a geographic area. This innovation, developed by UC Berkeley researchers, addresses this challenge by providing a sophisticated, multi-objective optimization method for targeted reduction of air pollution. The method generates a comprehensive mitigation pathway by integrating several modules: a forward module to model pollutant concentrations, a target concentration surface that defines the policy goals, a prioritization module to assess uncertainty and importance via a prioritization covariance matrix, and a Bayesian inversion module to estimate optimum emissions required to meet the target. This systematic, data-driven approach culminates in a mitigation pathway that guides the performance of specific pollution control measures, offering a significant advantage over conventional, less targeted policy-making by ensuring resources are directed where they will have the maximum environmental impact.

## SUGGESTED USES

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To design targeted and efficient environmental policies for reducing multiple air pollutants in specific geographic regions.

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To provide optimum emissions estimates required to meet predefined air quality standards.

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To generate actionable mitigation pathways for pollution control measures (e.g., regulating specific sources).

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To optimize resource allocation for environmental cleanup and policy implementation.

## ADVANTAGES

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»

Provides an optimized, multi-objective solution for complex environmental policymaking.

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Integrates forward modeling (concentration prediction) with Bayesian inversion (emissions estimation) for robust results.

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Generates a mitigation pathway that translates data into concrete, actionable pollution control measures.

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Accounts for uncertainty and prioritization through the use of a covariance matrix.

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Enables the targeted reduction of one or more specific pollutants.

## RELATED MATERIALS

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### ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

► [INFE<sup>2</sup>R \(INversion for Fine-scale Emissions and Exposure Refinement\)](#)



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